

DOCUMENT RESUME

ED 038 029

EM 007 921

AUTHOR O'Neil, Harold F., Jr.
TITLE Effects of Stress on State Anxiety and Performance
in Computer-Assisted Learning.
INSTITUTION Florida State Univ., Tallahassee. Computer-Assisted
Instruction Center.
SPONS AGENCY Office of Naval Research, Washington, D.C.
Psychological Sciences Div.
REPORT NO TR-6
PUB DATE 1 Jan 70
NOTE 141p.

EDRS PRICE EDRS Price MF-\$0.75 HC-\$7.15
DESCRIPTORS *Anxiety, College Students, Computer Assisted
Instruction, Experiments, *Performance Factors,
*Stress Variables

ABSTRACT

Subjects for this study were women college students who differed in anxiety proneness. The subjects were selected on the basis of extreme scores on the State-Trait Anxiety Inventory. Stress was induced by feedback concerning performance on a mathematical learning task which was presented by an IBM 1500 computer-assisted instruction (CAI) system. Some subjects received negative feedback about performance; others were given a brief rest period in place of the negative feedback. Subjects who were anxiety prone showed a greater increase in anxiety from pretask levels than did the subjects who were not anxiety prone. There was no relationship between anxiety proneness and errors on the CAI learning task. However, subjects who were given negative feedback performed less well than those who did not receive negative feedback. Appendices include the material used to conduct the experiment, raw data, and analyzed data. A bibliography is also appended. (JY)

ED038029

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TECH REPORT

EFFECTS OF STRESS ON STATE ANXIETY AND PERFORMANCE
IN COMPUTER-ASSISTED LEARNING

Harold F. O'Neil, Jr.

Tech Report No. VI
January 1, 1970

Project NR 154-280
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Personnel & Training Research Programs
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Contract No. N00014-68-A-0494

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EFFECTS OF STRESS ON STATE ANXIETY AND PERFORMANCE
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This study tested hypotheses about the effects of anxiety on learning derived from Spence-Taylor Drive Theory and Spielberger's Trait-State Anxiety Theory. The effects of stress on state anxiety (A-State) and on performance in a computer-assisted learning task were investigated for female introductory college students who differed in anxiety proneness (A-Trait). The Ss were selected on the basis of extreme scores on the A-Trait scale of the State-Trait Anxiety Inventory (Spielberger, et al., 1969).

Stress was induced by feedback concerning performance on a mathematical learning task which was presented by an IBM 1500 CAI system. In the stress condition, Ss received negative feedback about performance. The Ss in the nonstress condition were given a brief rest period in place of the negative feedback.

High A-Trait (HA) Ss in the stress condition showed a significantly greater initial increase in A-State from pretask levels than did the low A-Trait (LA) Ss. During the learning task, HA Ss in the stress condition showed a marked decline in A-State whereas level of A-State remained relatively constant for LA Ss. In the nonstress condition, the changes in A-State for HA and LA Ss were quite similar. Both groups showed almost the same increase in A-State from pretask levels and approximately parallel changes in the level of A-State during the learning task.

There was no relationship between A-Trait and errors on the CAI learning task. In contrast, Ss with high levels of A-State made more errors than low A-State Ss throughout the learning task. The differences in the performance of high A-State and low A-State Ss were significant on the easier sections of the CAI task, but not for the most difficult part of the task. These relationships between A-State and errors differed from previous research (O'Neil, Hansen, & Spielberger, 1969).

The findings were consistent with predictions derived from Trait-State Anxiety Theory, but not with derivations from Drive Theory. The failure to find empirical support for Drive Theory was attributed to differences in the motivational structures of men and women that affect the relationship of Drive (A-State) and performance.

ACKNOWLEDGEMENTS

I am very grateful to Dr. Charles D. Spielberger, who guided this dissertation from its inception and generously contributed to it his time, patience, and invaluable critical insights. My debt to Dr. Duncan Hansen is a tremendous one. Dr. Hansen sustained and supported me intellectually and personally throughout my graduate work at Florida State University. I also acknowledge the advice and assistance of my committee members.

Former teachers who were not actually present during the time I wrote this dissertation but whose influence I gratefully acknowledge are: Father William Lucy of Cardinal O'Connell Seminary, Jamaca Plain, Massachusetts; Dr. Frank Ryan, former Assistant Professor at Florida State University; and Professors Paul Woods and Ronald Webster of Hollins College, Hollins College, Virginia.

Over the past two and one-half years, the staff of the Computer-Assisted Instruction Center has assisted me materially. For my dissertation: Mrs. Betty Wright, Mrs. Charlotte Crawford, and Mrs. Sharon Papay diligently coded the CAI course material; Mr. Beverly Davenport, Mr. Eugene Wester, Mr. Wayne Lee, Mr. George Hogshead, Mr. Dave Danner, Mr. Jim Guerry and Mr. Bruce Freed ably developed and operated the computer programs used in data analysis; and Mrs. Louise Crowell, Mrs. Dorothy Carr, Mrs. Mary Calhoun, Mrs. Ann Welton, and Miss Harvey Varner cheerfully assisted with the technical preparation

of the manuscript. In this last respect, I am especially grateful to Miss Varner. Also, the graduate students at the Computer-Assisted Instruction Center gave me much valuable after-hours support.

This dissertation is dedicated to my parents and to my wife, Susan.

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I. INTRODUCTION

The general purpose of this study was to investigate the effects of stress on state anxiety and learning for college students who differed in anxiety proneness (trait anxiety). Hypotheses about the effects of anxiety on learning were derived from Spence-Taylor Drive Theory and Spielberger's Trait-State Anxiety Theory. These theories also provided the conceptual framework within which research on anxiety and computer-assisted learning was examined. The background and current status of both theories are reviewed below.

The learning materials consisted of mathematical concepts presented by computer-assisted instruction (CAI). A CAI task was chosen for this study because it provided a context that permitted the presentation of learning materials under carefully controlled conditions that were more relevant to the real life interests of the S than is usually possible with traditional laboratory learning tasks. Such capacities of the CAI approach help to bridge the gap between laboratory research on learning and applications of learning principles in the classroom.

Drive Theory

In order to study the effects of anxiety on learning, a theory of learning that specifies the complex relationships between anxiety

and performance is needed. Drive Theory, as formulated by Spence (1958) and Taylor (1956), is especially useful for this purpose because it attempts to integrate associative and motivational variables in learning. In this theory, anxiety is equated with Hull's (1943) concept of Drive (D); level of D is usually inferred from scores on the Taylor (1953) Manifest Anxiety Scale (TMAS). It is generally assumed that individual differences in TMAS scores reflect differences in D.

In Drive Theory, there are three major assumptions concerning the learning process. First, it is assumed that both correct and erroneous response tendencies are evoked by a learning task, and that the latter continue to be elicited even as the correct response is learned. Second, Drive Theory posits that both correct responses and competing error tendencies are multiplied by D. Third, it is assumed that performance is jointly determined by level of D and the relative strengths of correct and competing response tendencies.

With regard to the effect of anxiety (D) on learning, Drive Theory predicts that the performance of high anxious Ss will be inferior to that of low anxious Ss on complex or difficult learning tasks in which competing error tendencies are stronger than correct responses. In contrast, on simple learning tasks, in which correct responses are dominant relative to incorrect response tendencies, it would be expected that the performance of high anxious Ss would be superior to that of low anxious Ss. Although the findings of most studies utilizing the TMAS as a measure of D have provided support for Drive Theory (e.g., Lucas, 1952; Montague, 1953; Raymond, 1953; Spence, 1964; Spence, & Spence, 1966; Taylor, & Chapman, 1955), some

investigators have reported results inconsistent with predictions from this theory (e.g., Hughes, Sprague, & Bendig, 1954; Kamin, & Fedorchak, 1957).

Trait-State Anxiety Theory

Research on anxiety and learning guided by Drive Theory has suffered from ambiguity with regard to the status of anxiety as a theoretical concept. Spielberger (1966) has emphasized the necessity to distinguish between anxiety conceptualized as a transitory state and as a relatively stable personality trait. According to Spielberger (1966, pp. 16-17):

Anxiety states (A-states) are characterized by subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomic nervous system. Anxiety as a personality trait (A-trait) would seem to imply a motive or acquired behavioral disposition that predisposes an individual to perceive a wide range of objectively nondangerous circumstances as threatening, and to respond to these with A-state reactions disproportionate in intensity to the magnitude of the objective danger.

A fundamental task for a trait-state conception of anxiety is to specify the classes of stimuli that induce differential levels of A-State in Ss who differ in A-Trait. On the basis of a comprehensive review of research findings with anxiety scales, Sarason (1960) noted that the performance of Ss with high scores on various measures of anxiety was more adversely affected by failure instructions than was the performance of Ss who scores low on these measures.

Results similar to those reported by Sarason (1960) were obtained by Denny (1966) and by Spielberger and Smith (1966) on learning tasks with ego-involving instructions. In these studies, the performance of high anxious Ss was inferior to that of low anxious Ss

on tasks with high error rates; on such tasks it is reasonable to assume that incorrect responses were stronger than the correct ones. In contrast, on tasks in which correct responses were dominant, as indicated by low error rates, high anxious Ss performed better than low anxious Ss. It should be noted, however, that Spielberger and Smith (1966) found no relationship between anxiety and performance for their learning task when it was given with "neutral" instructions. Apparently, the neutral instructions failed to elicit differential levels of A-State for Ss who differed in A-Trait.

Most previous studies of anxiety and learning have used measures of anxiety such as the TMAS to select Ss on the assumption that those with high scores were higher in D than those with low scores. Since the TMAS appears to be a measure of trait anxiety (Spielberger, 1966), this procedure is questionable in that the concept of D is logically more closely associated with A-State than with A-Trait.

While Drive Theory does not differentiate between trait and state anxiety, most of the evidence supporting this theory is based on experimental applications of A-Trait measures. As previously noted, persons high in A-Trait tend to show performance changes attributed to increases in A-State in situations characterized by failure or ego-involving instructions. It has also been shown that situations involving threats of physical danger or harm do not evoke differential levels of A-State for Ss who differ in A-Trait (Katkin, 1965; Hodges, 1968; Hodges, & Spielberger, 1966). Thus, in order for an experimental

situation to have differential impact on A-State for Ss who differ in A-Trait, some type of interpersonal stress appears to be required.

Spielberger, Lushene, and McAdoo (1969) suggest that the results of research on anxiety and learning are consistent with the hypothesis that high A-Trait (HA) Ss respond with higher levels of A-State than low A-Trait (LA) Ss in situations that are made stressful by failure of ego-involving instructions. It follows from Drive Theory that high D associated with higher levels of A-State facilitates performance on simple tasks in which correct responses are dominant, and leads to performance decrements through the activation of erroneous responses on difficult tasks in which there are strong error tendencies.

The effects of failure instructions on A-State for Ss who differed in A-Trait was recently investigated by Hodges (1967, 1968). He used instructions and feedback about performance to induce different kinds of stress in college students who were given a memory task. His self-report measures of A-State were the Zuckerman (1960) Affect Adjective Check List (AACL) and the State Trait Anxiety Inventory (STAI) A-State scale (Spielberger, Gorsuch, & Lushene, 1969). While Hodges found that A-State scores increased in all three of his experimental conditions, only in his failure feedback condition did HA Ss show greater increases in A-State than LA Ss. Higher levels of A-State were observed when Ss were threatened with electric shock than when given success feedback, but the magnitude of the increase in A-State in these conditions was approximately the same for HA and LA Ss. It was also found that the performance of the high A-State Ss was inferior to that of low A-State Ss on the memory task.

Drive Theory specifies the effects of individual differences in D on performance in learning experiments. It seems more reasonable, however, to infer differences in D from measures of A-State than by selecting Ss who differ in A-Trait. Trait-State Anxiety Theory augments predictions derived from Drive Theory about performance in learning experiments by specifying the conditions in which Ss differing in A-Trait will be expected to show differences in A-State. The extent to which Drive Theory is supported in the research literature is probably due to the fact that most studies in the Drive Theory tradition typically expose Ss, selected on the basis of an A-Trait measure, to ego-involving or failure instructions which induce differential levels of A-State in persons who differ in A-Trait.

In the next section, Trait-State Anxiety Theory and Drive Theory will be utilized as a conceptual framework for evaluating and interpreting findings from the anxiety literature that are most relevant to computer-assisted learning.

The Effect of Anxiety on Computer-Assisted Learning

Computer-Assisted Instruction (CAI) implies a set of procedures in which a computer is employed to control the selection, sequencing, and evaluation of instructional materials (Fishmen, Keller, & Atkinson, 1968). In CAI systems, a computer in an instructional role interacts with a S. Before considering investigations specifically concerned with anxiety in computer-assisted learning, studies dealing with research on anxiety and programmed instruction (PI) are reviewed. This literature is evaluated for two reasons. First, the impetus for

much of the progress in CAI grows out of earlier work on PI; secondly, in both PI and CAI, learning materials are presented in systematic order designed to lead to intended instructional outcomes. Thus, many of the results concerning anxiety and PI can be generalized to computer-assisted instruction.

The review of the role of anxiety in the PI literature requires a prior definition of the terms "frame" and "linear program." A frame consists of the presentation of stimulus information and the S's response to this presentation. After a S responds, he is shown the right answer. This sequence of activities--the stimulus, the response, and the confirmation of the correct answer--defines a frame. A series of frames defines a program. A linear program consists of a series of sequentially ordered frames. In order to circumvent the lengthy instructional time required for linear programs, branching programs have been devised but they will not be considered here since only linear programs have been used in studies of anxiety and PI or CAI.

A search of the psychological and educational literature revealed only four investigations of the effects of anxiety on PI. Kight and Sassenrath (1966) presented college students PI materials that dealt with the construction and analysis of classroom achievement tests. They found that HA Ss as measured by the Test Anxiety Questionnaire (Mandler, & Sarason, 1952) worked faster and made fewer errors than LA Ss, but did not differ with regard to retention scores. Since Kight and Sassenrath's PI task was relatively easy, with a low error rate indicating few competing responses, their results

were consistent with the prediction from Drive Theory that HA Ss would perform better than LA Ss on such tasks.

The effects of both test anxiety and feedback on a programmed learning task dealing with earth-sun relationships were evaluated by Chapeau (1966). Her Ss were fifth grade school children whose anxiety was measured by the Test Anxiety Scale for Children (Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960). There were no significant differences among males on either an immediate or delayed retention test. On both the immediate and delayed retention tests HA females given feedback about the correctness of their responses performed better than without such feedback, whereas there were no differences in performance among LA females in these two feedback conditions. These results are seen as consistent with Drive Theory, if it is assumed that: (1) there were fewer competing responses in the feedback condition than in the no-feedback condition; and (2) high D adversely affected the performance of HA females in the no-feedback condition. In addition, one would also have to posit that Chapeau's (1966) task was perceived as threatening by the females but not by males, since differences in the performance of HA and LA Ss was found for females but not for males.

O'Reilly and Ripple (1967) investigated the impact of anxiety and other individual difference variables on learning for programmed materials that dealt with the concepts of latitude and longitude. For their sixth grade Ss, they found a correlation of $-.53$ between the Test Anxiety Scale for Children (Sarason, et al., 1960), and scores on a difficult posttest with a high error rate. These results are

consistent with the Drive Theory interpretation that HA Ss perform more poorly than LA Ss on tasks with numerous competing error tendencies.

In all three of the above studies, there was no explicit effort to experimentally induce differential levels of A-State, but testlike experimental situations were used in each of the studies. In two of the studies, elementary school children served as Ss in a school setting, thus accentuating the psychological stress that was involved in the experimental situation. In addition, since anxiety was measured by a test anxiety questionnaire in all three studies it is likely that Ss with high scores on such measures responded with higher levels of A-State than Ss with low scores in each of these experiments.

In contrast to the results of the anxiety and PI studies cited above, Tobias and Williamson (1968) found no significant differences in the performance of high TMAS and low TMAS Ss on a PI binary numbers program. In discussing their non-significant results, Tobias and Williamson noted that the anxiety indicated by their test scores was not reflected in the performance of their Ss, and they conclude (1968, p. 7) that "there would appear to be no substitute for actually inducing anxiety," and that "in order to provide a really adequate test of the effects of anxiety on programmed instruction, Ss who are both high and low on anxiety as measured by a questionnaire could be given stress and nonstress instruction . . . Ss who are high on a measure (of anxiety) . . . ought to be more susceptible to such stress instructions." In effect, Tobias and Williamson acknowledge a fundamental assumption of Trait-State Anxiety Theory, namely, that persons who are high in A-Trait will not necessarily be high in

A-State unless appropriate stress instructions are used. Their results further highlight the need to specify the classes of stimuli that induce differential levels of A-State in Ss who differ in A-Trait.

The findings in the studies previously reviewed can be adequately accounted for if Trait-State Anxiety Theory is used to explain the arousal of A-State in persons who differ in A-Trait, and if Drive Theory is employed to predict the effects of differences in A-State on behavior. It should be noted, however, that none of these studies were specifically designed to test either of these two theories. Two studies of anxiety and computer-assisted learning carried out at Florida State University were conceptualized and designed to test specific hypotheses derived from Trait-State Anxiety Theory and Drive Theory.

O'Neil, Spielberger, and Hansen (1969) investigated the relation between A-State and performance for college students who learned meaningful mathematics materials. The learning materials were presented by an IBM 1440 CAI system (IBM, 1965) which also recorded Ss' responses. The state anxiety measures were scores on the STAI A-State scale and changes in systolic blood pressure. Both A-State measures increased while Ss worked on difficult learning materials and decreased when they responded to easy materials. Subjects with high STAI A-State scores made more errors on the difficult materials and fewer errors on the easy materials than did low A-State Ss.

The findings of O'Neil, Spielberger, and Hansen (1969) were extended by O'Neil, Hansen, and Spielberger (1969) who investigated the impact of task order on A-State and computer-assisted learning. College males with extreme scores on the STAI A-Trait scale were used

as Ss. Difficult and easy CAI learning materials were presented by an IBM 1500 system (IBM, 1967) which also recorded responses and latencies. In addition, the computer presented the STAI A-State scales before, during and after the learning task. For half of the Ss the difficult materials were given first followed by the easy materials; for the remaining Ss, the easy materials were presented first followed by the difficult materials. It was found that HA Ss responded throughout the learning task with higher levels of A-State than LA Ss. The results of this study also confirmed the findings in the earlier study in that: (1) A-State scores increased while students worked on the difficult materials and decreased when they responded to easy materials; and (2) high A-State Ss made significantly more errors on the difficult materials than low A-State Ss. There was no relation between A-Trait and performance nor any effect of task order on either A-State or errors. In general, longer latencies were found on the difficult task, and low A-State Ss responded more slowly than high A-State Ss when making errors.

In both CAI studies, the finding that performance on the learning task was an interactive function of level of A-State and task difficulty is consistent with Drive Theory which would predict that high D would activate error tendencies on the more difficult section of the CAI task, on which error rate was relatively high, and facilitate correct responses on the easier section of the CAI task, for which the error rate was relatively low. The findings in both studies also provide support for Trait-State Anxiety Theory in that they point up the need to distinguish between A-Trait and A-State, to infer differences in D

from measures of A-State rather than from measures of A-Trait, and to obtain measures of A-State in the experimental situation.

On the assumption that the CAI situation involved an ego threat, it would be predicted from Trait-State Anxiety Theory that the magnitude of increase in A-State would be greater for HA Ss than LA Ss, but this expectation was not confirmed in either study. An analysis of the CAI situation revealed a possible explanation for the absence of any relationship between A-Trait and increases in A-State in the CAI setting. In the CAI task, an impersonal computer routinely provides feedback about the correctness of a response, but does not evaluate the adequacy of the S's performance relative to others. While the CAI task may be considered stressful, because it is difficult, it is not necessarily differentially stressful for HA and LA Ss because it does not pose a threat to the S's self esteem. However, if explicit negative evaluations concerning performance were presented to each S by the computer, then HA Ss might be expected to perceive the CAI situation as more threatening than LA Ss, and to respond with higher levels of A-State.

Statement of the Problem

The purpose of this study is to investigate the effects of two levels of stress on A-State intensity and on performance in a computer-based learning task for persons who differed in A-Trait. The Ss were selected on the basis of extreme scores on the STAI A-Trait scale. Different levels of psychological stress were induced by feedback concerning performance on a mathematical learning task which was presented by an IBM 1500 series computer system (IBM, 1967).

In the stress condition Ss received negative feedback; in the nonstress condition a brief rest period took the place of the negative feedback. There were two measures of performance on the learning task: errors and response latencies. The experimental procedures were divided into three periods: the pretask period in which the Ss read instructions; the performance period in which either negative evaluations or rest periods were interspersed during the learning task; and the post-task period in which Ss were interviewed and debriefed.

The following hypotheses were derived from Trait-State Anxiety Theory:

1. High A-Trait (HA) Ss were expected to display higher levels of A-State intensity than low A-Trait (LA) Ss throughout the experimental task.
2. Since the learning task was intrinsically stressful, it was hypothesized that level of A-State intensity would be higher in the performance period than in either the pretask period or the posttask period.
3. It was hypothesized that the stress condition would evoke higher levels of A-State than the nonstress condition.
4. During the performance period HA Ss in the stress condition were expected to respond with greater increments in A-State intensity than LA Ss. In contrast, for the nonstress condition, increments in A-State were expected to be independent of level of A-Trait.

On the assumption that level of D is a function of A-State, the following hypotheses were derived from Drive Theory:

5. For the more difficult sections of the learning task, high A-State Ss were expected to make more errors than low A-State Ss.
6. On the easier section of the learning task, high A-State Ss were expected to make fewer errors than low A-State Ss.

The limited literature concerning anxiety and latency response does not permit the derivation of explicit predictions for this measure.

However, in a previous study, O'Neil, Hansen, and Spielberger (1969), found that high A-State Ss had shorter error latencies on difficult materials than low A-State Ss. This relationship between A-State and response latency will be examined in the present study.

II. METHOD AND PROCEDURE

This study investigated the effects of psychological stress on level of state anxiety and on performance in a computer-assisted learning task for college students who differed in anxiety proneness (A-Trait). Subjects were selected for the experiment who were high and low in A-Trait. The nonstress and stress conditions were defined by neutral and negative feedback that was given to the Ss regarding their performance on the CAI learning task. The principal dependent variables were state anxiety and errors on the CAI learning task.

Anxiety Measures

The State-Trait Anxiety Inventory (Spielberger, Gorsuch & Lushene, 1969) was used to measure both A-Trait and A-State. The STAI A-Trait Scale was used to select Ss for this study who were high and low in A-Trait. The 20-item STAI A-State scale was given before and after the learning task. In addition, a short form of the A-State scale (see Appendix A), consisting of the five items with the highest item-remainder correlations in the STAI normative sample, was given immediately after each of the three sections of the learning task. The alpha reliabilities for the three five item A-State scales were .86, .88, and .89, respectively as compared

with alpha reliabilities of .89 and .94 for the 20-item A-State scales given before and after the learning task.

Learning Materials

The CAI task consisted of difficult mathematics learning materials, relating to proofs of the field properties of complex numbers. These materials were adapted from the CAI task used by O'Neil, Hansen and Spielberger (1969). The task was divided into three sections, labeled, A, B, and C, with five problems per section. Programming logic required that the Ss solve each successive problem correctly before they could progress to the next one. Previous research (O'Neil, Hansen, & Spielberger, 1969) demonstrated that there were approximately 23 percent fewer errors on section B than section A and that there were also approximately 40 percent fewer errors on section C than section A. Since difficulty for this CAI task is defined in terms of errors, it may be concluded that section A is the most difficult. The learning materials are described in greater detail in Appendix B.

Apparatus

The learning materials were presented by an IBM 1500 Computer-Assisted Instruction System (IBM 1967). Terminals for this system consist of a cathode-ray tube (CRT), a light pen, and a keyboard. The terminals were located in an air-conditioned, sound-deadened room. The CAI system administered the STAI A-State scales and recorded the Ss' responses, including response latencies.

Selection of Ss

The A-State and A-Trait scales of the STAI were administered with standard instructions to 232 females and 351 males enrolled in the introductory psychology course at Florida State University in the Winter Quarter, 1969. The STAI was given either in class or in special group-testing sessions. From this population, females whose STAI A-Trait scores were in the upper and lower 20 percent of the distribution were selected and designated as the high A-Trait (HA) and low A-Trait (LA) groups, respectively.

The A-Trait cut-off scores for the HA Ss were 45 or above; the A-Trait scores for the LA Ss were 31 or below. The selected Ss were invited to participate in an experiment on computer-assisted learning. They were either contacted in class or called individually (see Appendix C). Approximately 70 percent of the Ss were assigned by a table of random numbers to either the stress or nonstress conditions. The remainder of the Ss were assigned in a manner such that the mean A-Trait and A-State scores obtained in class or special group testing sessions were comparable for HA Ss in the stress and nonstress condition. Likewise, these A-Trait and A-State scores were comparable for the LA Ss in the stress and nonstress conditions.

A total of 73 Ss were run in small groups of 8 to 13. Each group was processed by 3 to 5 male Es. Seven Ss were eliminated because of missing data, and two additional Ss were dropped from the LA nonstress group to provide for equal cell frequencies. The means and standard deviations for the A-Trait and A-State data

obtained prior to the experiment on Ss subsequently assigned to the High A-Trait/Stress (HA-S), the High A-Trait/Nonstress (HA-NS), the Low A-Trait/Stress (LA-S) and the Low A-Trait/Nonstress (LA-NS) groups are presented in Table 1. It may be noted that HA and LA Ss in the stress and nonstress condition are well matched on both A-Trait and A-State scores.

TABLE 1.--Mean A-Trait and A-State scores obtained prior to the experiment for HA and LA Ss in the stress and nonstress conditions

Groups	A-Trait	A-State
HA-Stress		
Mean	53.4	45.2
SD	6.5	8.8
HA-Nonstress		
Mean	49.8	43.0
SD	5.1	10.3
LA-Stress		
Mean	29.3	31.6
SD	2.1	8.7
LA-Nonstress		
Mean	27.4	30.1
SD	2.9	4.4

(N=16 for each group)

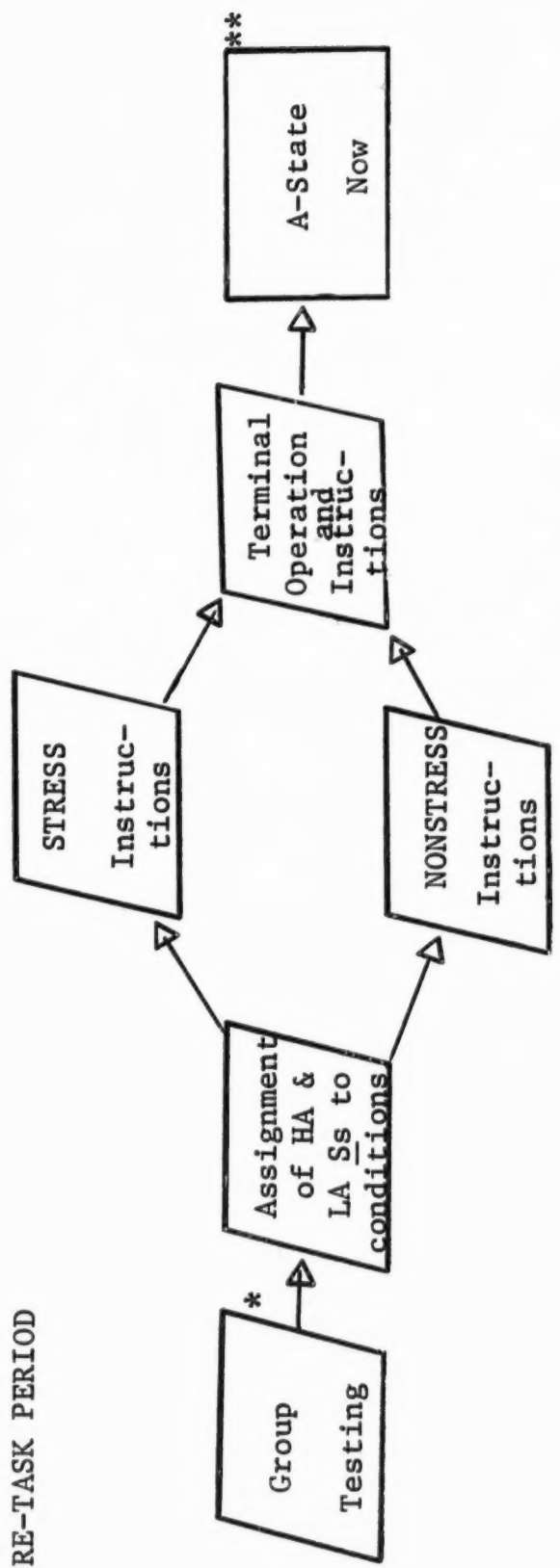
Experimental Procedures

The experimental session was divided into three periods:

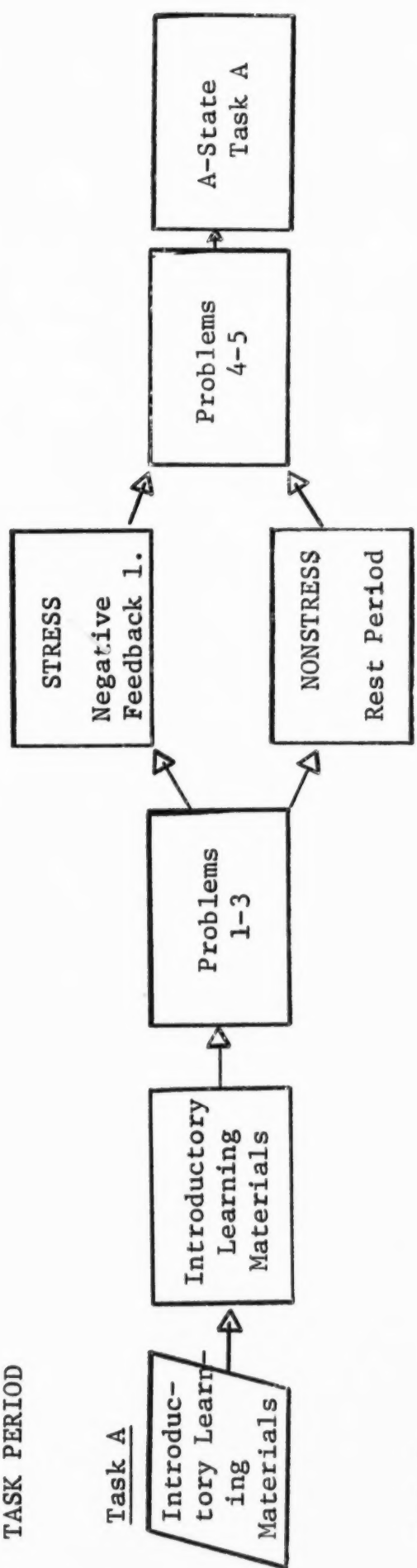
- (1) a pretask period during which Ss read instructions and learned how to operate the terminal;
- (2) a task period in which Ss learned the field properties of complex numbers and received differential feedback regarding their performance;
- (3) and a posttask period in

which Ss were interviewed, debriefed and given the Watson-Glaser Critical Thinking Appraisal Test (1952). These procedures are summarized in Figure 1 and described in detail below.

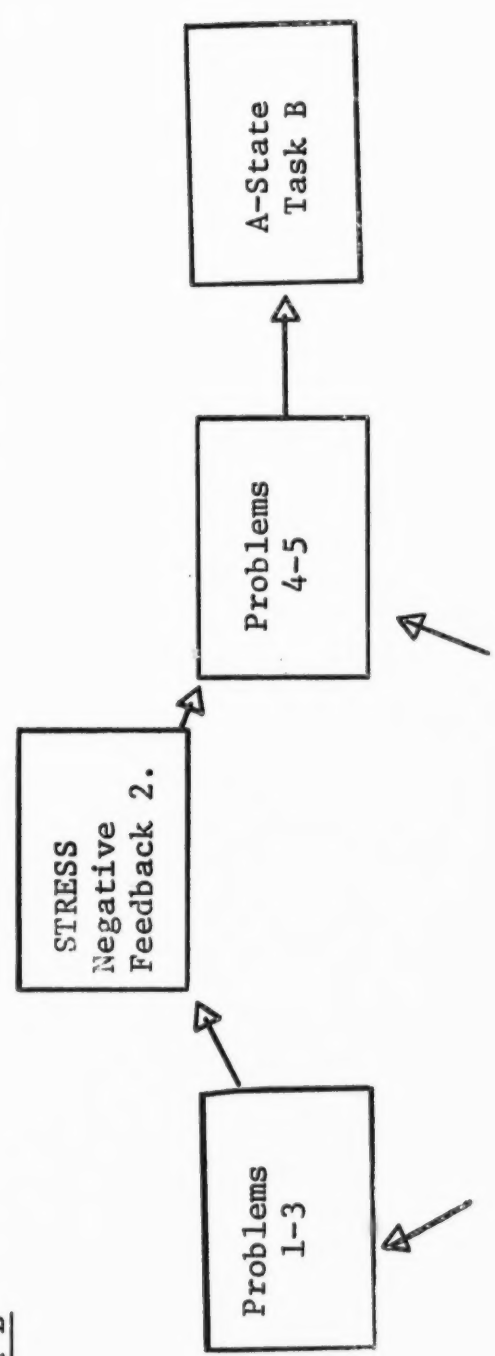
PRE-TASK PERIOD



TASK PERIOD



Task B



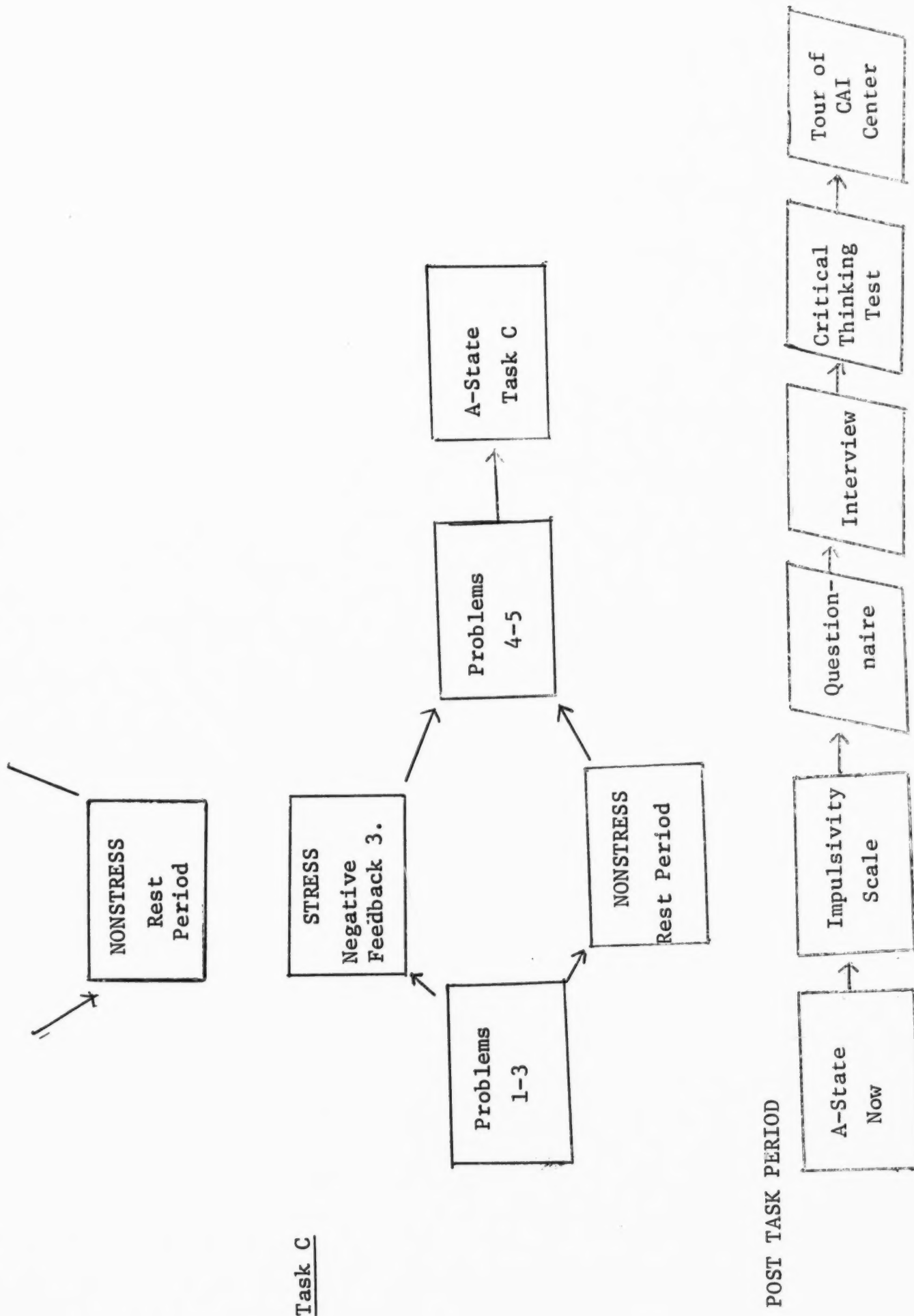


Fig. 1.--Summary of the procedural design indicating the sequence of activities for HA and LA Ss in the stress and nonstress condition.

*non-computer activities

**computer activities

Pretask Period

Each S reported to the CAI Center she was instructed to wait until the entire group had assembled. After the group assembled, the Ss were led into the experimental room and seated at CAI terminals. The Ss in the nonstress condition were given an introductory booklet (see Appendix D) which contained the following instructions:

It has been found that success in this program does not require mathematical or quantitative ability; it requires instead, the ability to make the same kind of abstractions and generalizations that you are expected to make in many college courses.

The Ss in the stress condition were given the same instructions, with the following sentence added at the end: "The computer has been programmed to evaluate your performance as you progress through the learning materials."

Subjects were then asked to read a description of the operation of the CAI terminal, after which group instructions were given to orient the Ss to the CAI task. (These group instructions may be found in Appendix E.) The Ss were then given practice in the operation of the light pen and keyboard and instructed how to carry out erase and enter functions. The Es answered questions and demonstrated the procedures as needed. After "signing on," all Ss responded to the STAI A-State scale which was given with standard instructions ("indicate how you feel right now").

Task Period

During the task period all Ss worked through the same learning materials, each progressing at her own speed. Immediately after sections A, B, and C of the learning task, the short forms of the STAI

A-State scale were given to all Ss with instructions to "indicate how you felt during the section of the course you have just finished." Following the third problem in each of the three sections of the learning task, Ss in the stress condition were given negative feedback while those in the nonstress condition received a rest period.

In a previous study using the same learning materials, it was found that errors decreased significantly across the task (O'Neil, Hansen & Spielberger, 1969), therefore, it was necessary to develop three different negative feedback statements. The first of these evaluative statements focused upon adequacy of performance, the second on the speed and accuracy of the Ss' performance, and the third primarily on speed. The three feedback statements in the order they were presented were: (a) "You are doing more poorly than most of the other students I have processed: try harder." (b) "Although you are improving, you could do better if you tried harder. Many students respond more accurately and quickly than you." (c) "You are not making too many errors but you are still performing too slowly. Usually students got as many right as you did in considerably less time than it has taken you." All three negative feedback statements were presented for 15 seconds, by the computer, under the title "Evaluation."

Subjects in the nonstress condition were instructed by the computer to "Take a brief rest." This rest statement was presented for 15 seconds at exactly the same place in the program that the stress groups were given negative feedback.

Posttask Period

After each S completed the learning task, she was given the final A-State measure (with standard instructions) followed by Barratt's (1959) Impulsivity scale. She then filled out a 15 minute structured questionnaire (see Appendix F) that inquired about her reactions to the experiment whether she had any prior knowledge of it. None of the Ss indicated any prior knowledge.

After each S completed the questionnaire, she was informed that the task was quite difficult and reassured that her performance had been satisfactory. The Ss were then debriefed, given some additional information concerning the general nature of the experiment, and cautioned not to discuss the experiment with her classmates. Finally, each S was given the Watson-Glaser Critical Thinking Appraisal Test (1952) and offered a tour of the CAI Center; about half of the Ss accepted.

III. ANALYSIS OF THE DATA

The data analysis is organized into three major sections. In the first section, changes in STAI A-State scores were evaluated as a function of level of A-Trait and experimental conditions. Next, errors on the CAI learning task were examined as a function of A-Trait and experimental conditions. Finally, the relationship between A-State and errors was evaluated. Since the CAI latency data were considered exploratory, the analyses of these data are reported in Appendix G.

Changes in STAI A-State During the Experiment

Changes in level of A-State during each of the experimental periods were examined as a function of A-Trait and experimental conditions. The STAI A-State measures were taken on five different occasions: at the beginning and at the end of the experimental task, and immediately after each of the three sections of the learning task. The statistical analysis of the A-State data is based on the short form of the STAI A-State scale. The same five items in the short form were extracted from the total A-State scale given before and after the experimental task. For the pretask and posttask A-State measures, the correlations between these five item short forms with the remaining 15 items of the A-State scales were .75 and .84 respectively.

The means and standard deviations of the STAI A-State scores for the HA and LA Ss in the stress and nonstress conditions are reported in Table 2 for the pretask period, the three sections of the learning task, and the posttask period. These data were evaluated by a three-factor analysis of variance in which trait anxiety, experimental conditions and periods were the independent variables, with repeated measures on the last factor. The results of this ANOVA are presented in Table 3 in which the most important finding is the significant triple interaction. This A-Trait by conditions by periods interaction indicated that the A-State scores for HA and LA Ss were differentially influenced by the stress and nonstress experimental conditions. To clarify this interaction, two subsidiary analyses were run. The first analysis evaluated the Ss' initial reactions to the CAI learning task, while the second examined changes in A-State during the task.

TABLE 2.--The mean A-State scores for HA and LA Ss in the stress and nonstress conditions in the pretask period, in the three sections of the learning task and in the posttask period

Group	Pretask		Task A	Task B	Task C	Posttask	
	Long Form	Short Form				Short Form	Long Form
All groups							
Mean	35.4	9.0	13.1	11.6	11.5	10.8	41.2
SD	9.7	3.5	3.4	3.7	3.9	3.5	12.2
HA Stress							
Mean	37.2	9.2	15.9	13.2	12.4	12.3	48.1
SD	10.8	3.9	3.2	4.2	3.9	3.5	12.8
HA Nonstress							
Mean	38.8	10.1	13.3	12.3	12.4	11.4	43.1
SD	9.2	3.9	2.9	3.1	3.2	2.9	10.4
LA Stress							
Mean	34.8	8.7	11.6	11.5	11.6	10.4	40.4
SD	10.6	3.5	2.4	2.7	3.6	3.7	13.3
LA Nonstress							
Mean	30.7	8.0	11.5	9.4	9.8	8.9	33.2
SD	6.6	2.7	3.3	3.3	4.4	3.4	7.4

(N=16 for each group)

TABLE 3.--Summary of the overall analysis of variance of A-State scores for HA and LA Ss

Source	df	MS	F	P
A-Trait (A)	1	359.1	8.1	<.01
Conditions (C)	1	75.1	1.7	
A x C	1	6.3	<1	
Error (b)	60	44.4		
Periods (P)	4	141.5	38.1	<.01
A x P	4	7.3	2.0	
C X P	4	6.3	1.7	
A x C x P	4	12.6	3.4	<.05
Error (w)	240	3.7		

Initial Reactions to the CAI Learning Task

In order to ascertain initial reactions to the CAI learning task, changes in A-State from the pretask period to Task A were examined as a function of level of A-Trait and experimental conditions. The mean STAI A-State scores obtained in the pretask period and in Task A are presented in Figure 2; the results of the analysis of variance computed for these data are summarized in Table 4. As in the overall analysis, a significant triple interaction involving A-Trait, experimental conditions and periods was obtained, indicating that the initial reactions of HA and LA Ss were differentially influenced by the stress and nonstress experimental conditions.

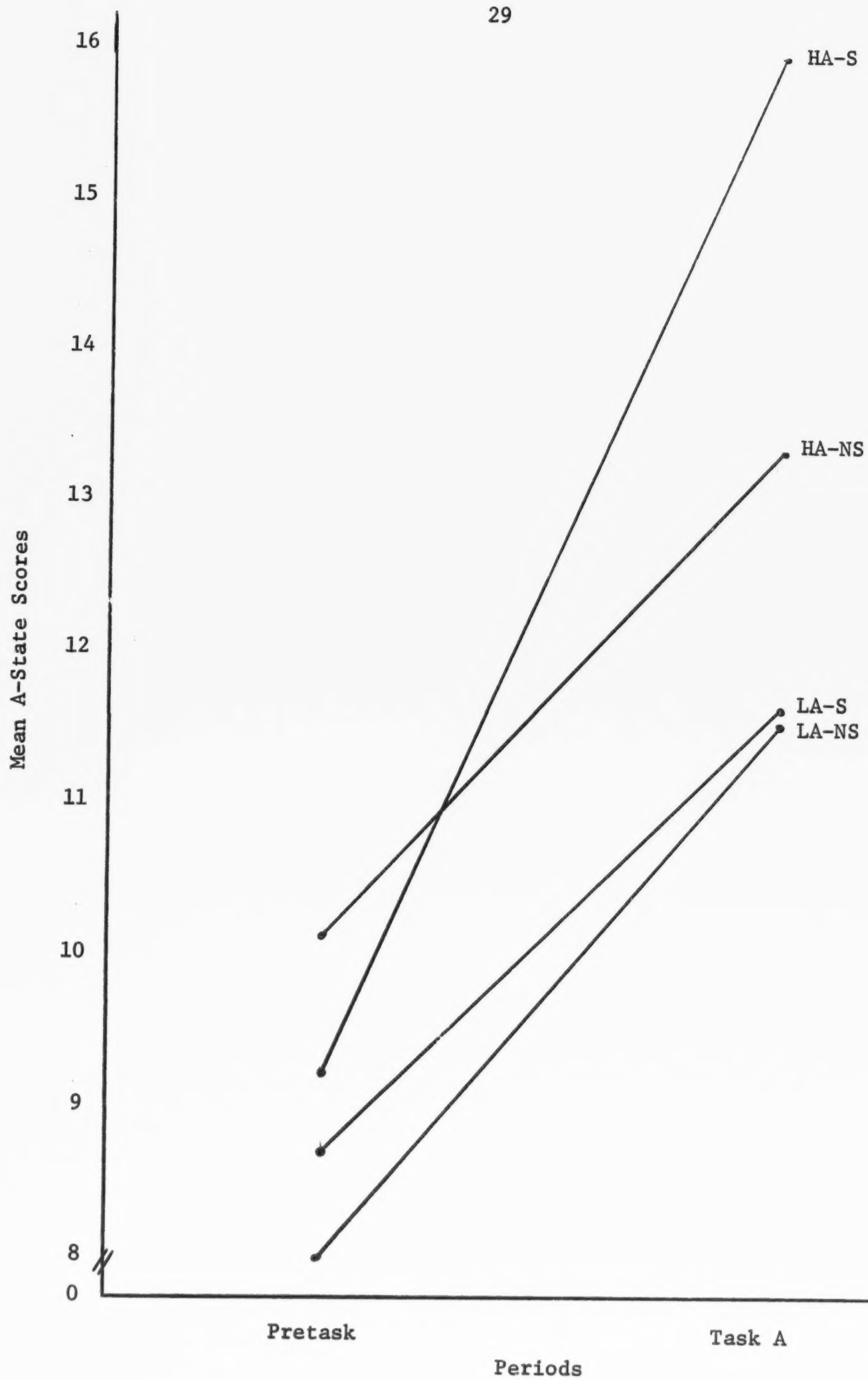


Fig.2.--Mean A-State scores for the initial reactions of HA and LA Ss

TABLE 4.--Summary of the analysis of variance of A-State scores for the initial reactions of HA and LA Ss

Source	df	MS	F	P
A-Trait (A)	1	150.9	8.9	<.01
Conditions (C)	1	11.9	<1	
A x C	1	1.8	<1	
Error (b)	60	16.9		
Periods (P)	1	532.2	122.3	<.01
A x P	1	25.4	5.8	<.01
C x P	1	15.8	3.6	
A x C x P	1	33.0	7.6	<.01
Error (w)	60	4.4		

The pretask and Task A A-State scores were further evaluated to determine how stress differentially influenced A-State for Ss who differed in A-Trait. Separate two-factor analyses of variance were computed for the HA and LA Ss. In these analyses, which are reported in Table 5, stress-nonstress conditions and experimental periods were the independent variables. For the HA Ss (Table 5A), a significant conditions by periods interaction was obtained. This finding indicated that the HA Ss showed a greater increase in A-State in the stress condition than in the nonstress condition, as may be noted in Figure 2. For the LA Ss (Table 5B), only the periods main effect was significant. In the absence of a significant conditions by periods interaction, this finding indicated that, for the LA Ss, the observed increase in A-State scores from the pretask period to Task A was about the same in the stress and nonstress conditions. Thus, for HA Ss the stress condition produced a greater increase in A-State than did the nonstress condition, whereas for LA Ss the increase in A-State was about the same in both experimental conditions.

TABLE 5.--Summary of analyses of variance of A-State scores for HA and LA Ss in the pretask and Task A period

Source	df	A. HA <u>Ss</u>			B. LA <u>Ss</u>		
		MS	F	P	MS	F	P
Conditions (C)	1	11.4	<1		2.3	<1	
Error (b)	30	19.3			14.4		
Periods (P)	1	395.0	75.9	<.01	162.6	46.5	<.01
C x P	1	47.3	9.1	<.01	1.6	<1	
Error (w)	30	5.2			3.5		

Next, the changes in A-State of HA and LA Ss were evaluated separately for the stress and the nonstress conditions. A-Trait and periods were the independent variables in these two-factor ANOVA's which are summarized in Table 6. The A-Trait by periods interaction in the ANOVA for the stress condition (Table 6A) indicated that HA Ss responded with greater increments in A-State than LA Ss, as may be noted in Figure 2. A similar analysis for the nonstress condition, which is presented in Table 6B, yielded only a significant main effect of periods. Given the nonsignificant A-Trait by periods interaction, the periods effect indicated that magnitude of the observed increase in the scores in the nonstress condition was approximately the same for HA and LA Ss.

TABLE 6.--Summary of analyses of variance of A-State scores for the stress and nonstress conditions in the pretask period and Task A period

Source	df	A. Stress Condition			B. Nonstress Condition		
		MS	F	P	MS	F	P
A-Trait (A)	1	92.6	5.3	<.05	60.1		
Error (b)	30	17.5			16.3		
Periods (P)	1	365.8	87.4	<.01	182.3	40.4	<.01
A x P	1	58.1	13.9	<.01	0.3		
Error (w)	30	4.2			4.5		

Changes in A-State During the Experimental Task

To evaluate changes in A-State during learning, the STAI A-State scores obtained in sections A, B, and C of the CAI learning task were examined. Figure 3 presents the mean A-State scores for HA and LA Ss in the stress and nonstress conditions. The overall three-factor ANOVA for these data is summarized in Table 7. The significant triple interaction, which involved A-Trait, experimental conditions and periods indicated that the experimental conditions had differential effects on level of A-State for HA and LA Ss in the three sections of the learning task.

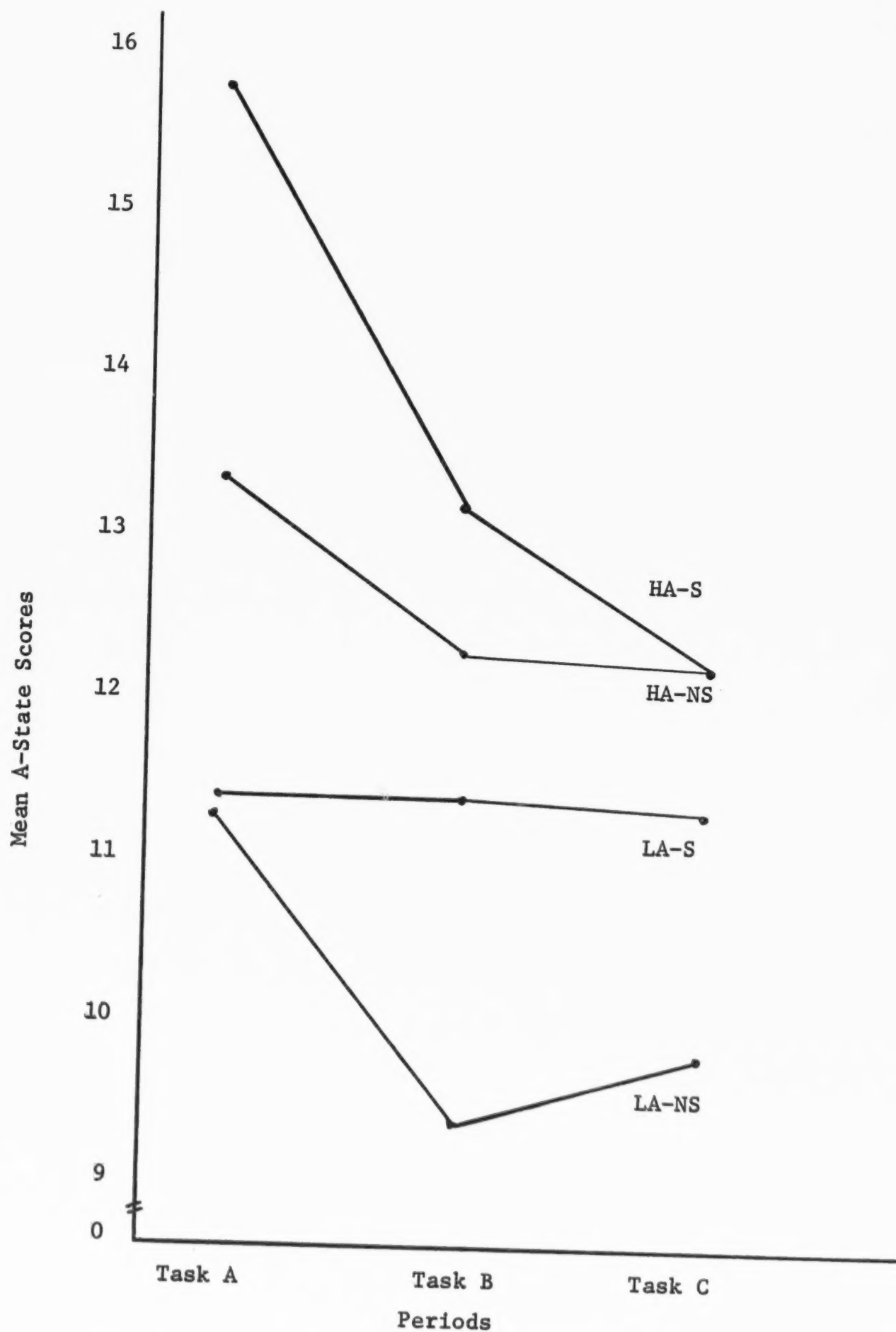


Fig. 3.--Mean A-State scores obtained during the learning task for HA and LA Ss.

TABLE 7.--Summary of analysis of variance of A-State scores of HA and LA Ss obtained during the experimental task

Source	df	MS	F	P
A-Trait (A)	1	266.0	8.90	<.01
Conditions (C)	1	75.0	2.5	
A x C	1	0.5	<1	
Error (b)	60	29.9		
Periods (P)	2	48.1	17.6	<.01
A x P	2	7.6	2.8	
C x P	2	1.3	<1	
A x C x P	2	22.4	8.2	<.01
Error (w)	120	2.7		

To clarify this triple interaction, separate two-factor analyses of variance were computed for the HA and the LA Ss. The results of these analyses, in which experimental conditions and periods were the independent variables, are reported in Table 8. For the HA Ss (Table 8A) the conditions by periods interaction was significant. This interaction, which is graphed in Figure 4A, may be attributed to two sources. First, level of A-State was higher in Task A for the HA Ss in the stress condition than for the HA non-stress Ss, apparently due to the initial impact of negative feedback on level of A-State (see Figure 2). Second, HA Ss in the stress condition showed a greater decline in A-State than did HA Ss in the nonstress condition so that by Task C, level of A-State was about the same for the HA Ss in both conditions (see Figure 4A).

TABLE 8.--Summary of analyses of variance of A-State scores for HA and LA Ss in Task A, Task B, and Task C

Source	df	A. HA Subjects			B. LA Subjects		
		MS	F	P	MS	F	P
Conditions (C)	1	31.5	1.1		44.0	1.4	
Error (b)	30	28.0			37.8		
Periods (P)	2	45.1	12.2	<.01	10.5	5.9	<.01
C x P	2	13.6	3.7	<.05	10.1	5.7	<.01
Error (w)	60	3.7			1.8		

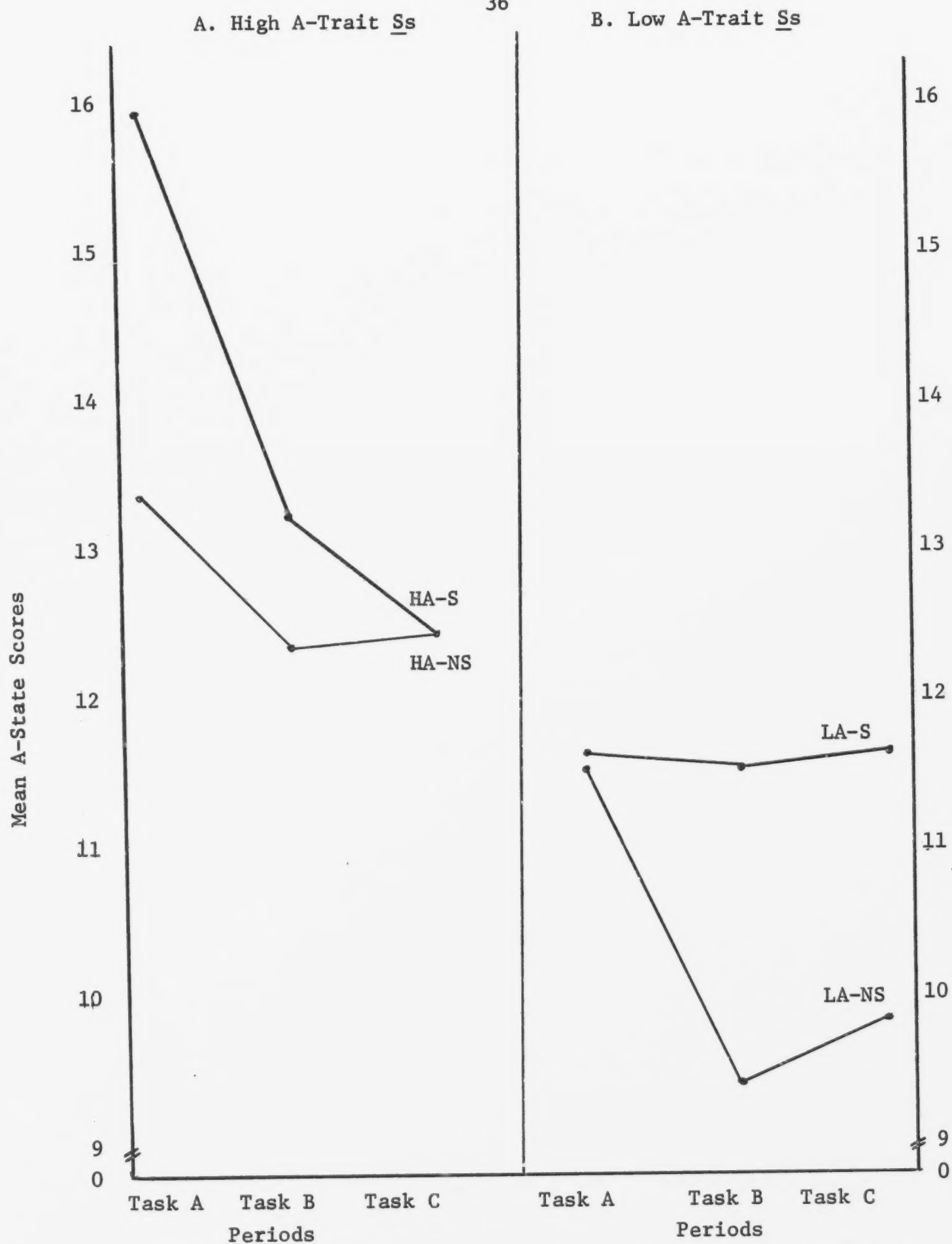


Fig. 4.--Mean A-State scores for HA and LA Ss in Task A, Task B, and Task C

The conditions by periods interaction was also significant for the LA Ss, as may be noted in Table 8B. This finding, which is presented graphically in Figure 4B, also appears to result from two sources. First, level of A-State on Task A was about the same for the LA Ss in both experimental conditions, indicating comparable initial reactions to the task. Second, while level of A-State for LA Ss in the stress condition remained relatively stable throughout the learning task, the A-State scores for LA Ss in the nonstress condition decreased during the task so that by Task C, LA Ss in the nonstress condition had substantially lower A-State scores than LA Ss in the stress condition. Thus, level of A-State for the LA Ss in the stress condition was maintained at initial levels, presumably due to the impact of negative feedback, whereas the decline in A-State for LA Ss in the nonstress condition seems to reflect adaptation to the task as it became easier and possible also less threatening.

To provide further clarification of the A-Trait by conditions by periods interaction for the A-State data obtained during the experimental task, separate two-factor analyses of variance were computed for the stress and nonstress conditions. In these analyses, A-Trait and periods were the independent variables. In the analysis for the stress condition, which is presented in Table 9A, the A-Trait by periods interaction was significant. This finding indicated, as may be noted in Figure 5A, that the initial high levels of A-State for HA Ss in the stress condition showed a marked decline where as the A-State scores for LA Ss in the stress condition were relatively stable. In the comparable ANOVA computed for the nonstress condition,

the A-Trait and the periods main effects were significant (Table 9B). In the absence of an A-Trait by periods interaction these results indicated that level of A-State for the HA Ss was higher than for the LA Ss throughout the experiment, and that level of A-State for both HA and LA Ss in the nonstress condition declined during the experimental task, as may be noted in Figure 5B.

TABLE 9.--Summary of analysis of variance of A-State scores in the stress and nonstress condition for Task A, Task B, and Task C

Source	df	A. Stress Condition			B. Nonstress Condition		
		MS	F	P	MS	F	P
A-Trait (A)	1	121.5	4.3	<.05	145.0	4.6	<.05
Error (b)	30	28.6			31.3		
Periods (P)	2	26.5	8.9	<.01	22.9	9.2	<.01
A x P	2	27.3	9.1	<.01	2.7	1.1	
Error (w)	60	3.0			2.5		

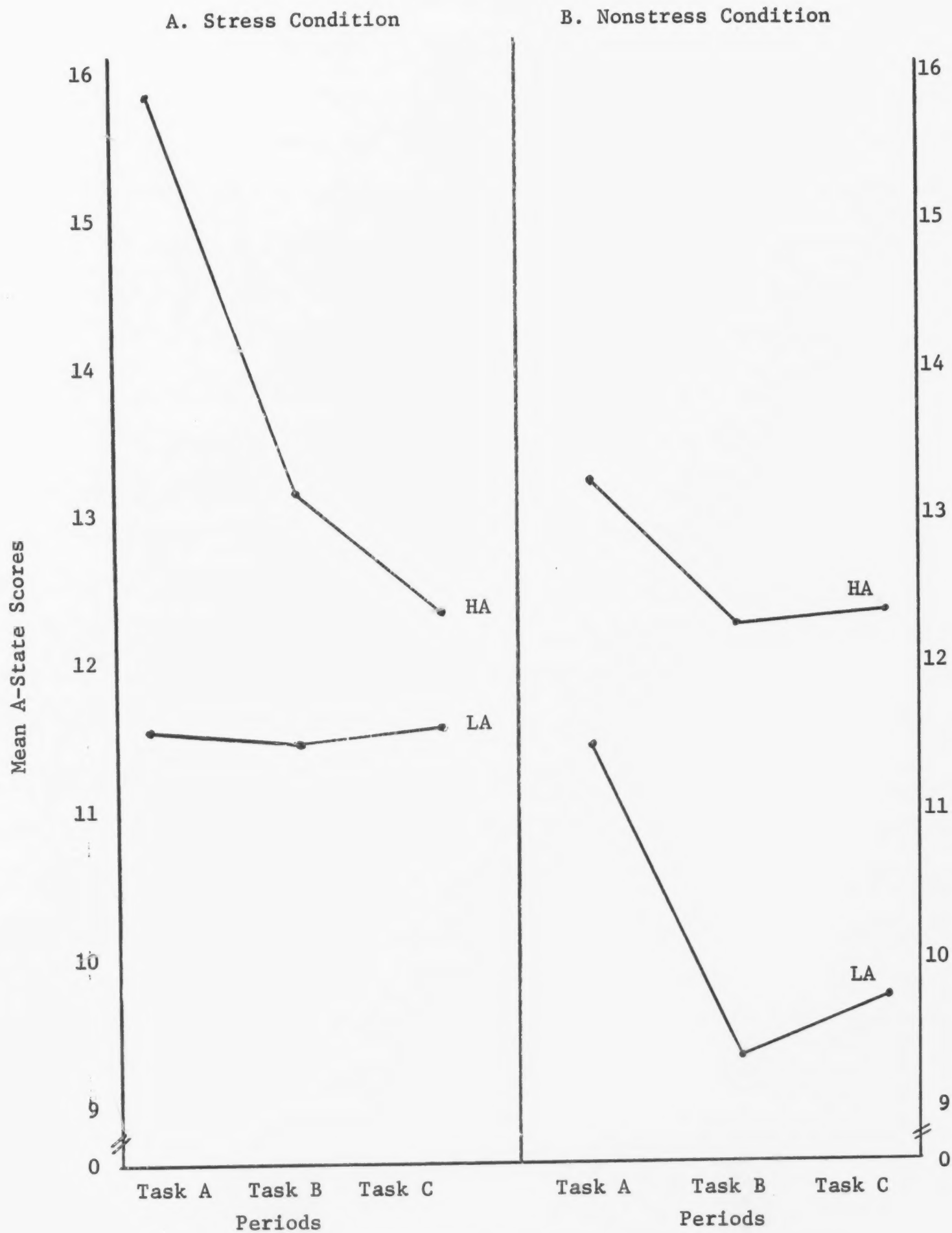


Fig.5.--Mean A-State scores for the Stress and Nonstress condition in Task A, Task B, Task C

In summary, in the stress condition the HA Ss demonstrated a greater initial increase in A-State from pretask levels than did LA Ss. During the learning task, HA Ss in the stress condition showed a marked decline in A-State whereas level of A-State remained relatively constant for LA Ss. In the nonstress condition, the changes in A-State for HA and LA Ss were quite similar. Both groups showed almost the same increase in A-State from pretask levels and approximately parallel changes in the level of A-State during the learning task.

Effects of Experimental Conditions on Errors
For HA and LA Ss

The means and standard deviations for errors made by HA and LA Ss in the stress and nonstress conditions on Tasks A, B, and C are given in Table 10. These data were evaluated by a three-factor ANOVA in which A-Trait, conditions, and periods were the independent variables and number of errors per problem for each section of the learning task was the dependent variable. The results of this ANOVA are summarized in Table 11, in which it may be noted that the only significant finding was the main effect of periods. This finding indicated that the number of errors for all groups decreased from Task A to Task C. The absence of any statistically significant effects involving A-Trait and experimental conditions indicated that errors in the three sections of the learning task were not influenced either by level of A-Trait or by experimental conditions.

TABLE 10.--The mean number of errors for HA and LA Ss in the stress and nonstress conditions in Task A, Task B, and Task C

Groups	Task A	Task B	Task C
All groups			
Mean	3.2	1.7	1.4
SD	2.1	2.5	1.8
HA Stress			
Mean	3.0	2.1	1.4
SD	1.8	3.1	1.6
HA Nonstress			
Mean	3.7	1.9	1.9
SD	2.7	1.9	2.1
LA Stress			
Mean	3.1	1.2	1.4
SD	1.9	2.6	1.8
LA Nonstress			
Mean	2.9	1.8	1.1
SD	1.9	2.6	1.6

(N=16 for each group)

TABLE 11.--Summary of analysis of variance of errors for HA and LA Ss in the stress and nonstress conditions in Task A, Task B, and Task C

Source	df	MS	F	P
A-Trait (A)	1	8.3	<1	
Conditions (C)	1	1.3	<1	
A x C	1	1.1	<1	
Error (b)	60	9.2		
Periods (P)	2	55.5	21.6	<.01
A x P	2	0.1	<1	
C x P	2	0.1	<1	
A x C x P	2	3.5	1.4	
Error (w)	120	2.6		

The findings in the present study that errors on the CAI learning task were independent of levels of A-Trait are consistent with the results of O'Neil, Spielberger, and Hansen, (1969). However, these investigators demonstrated that the relationship between A-State and errors rather than A-Trait and errors was consistent with predictions from Drive Theory. Therefore, in the next section, the relation between errors and A-State is evaluated.

The Effect of Level of A-State on Errors

Since level of A-State changed significantly over the experimental task (see Figure 3), level of A-State for each task was used to predict performance on that task. This logic required that the errors for Task A, B, and C would be analyzed separately as a function of level of A-State within each task. For each task, the STAI A-State scores obtained in the task were divided at the median. Subjects whose A-State scores were above the median were designated as the high A-State group; those whose A-State scores fell below the median were designated as the low A-State group. The median A-State scores obtained in Task A, B, and C were 12, 12, and 11 respectively. For each task, Ss whose A-State scores fell at the median were assigned to the group with the smaller number of Ss.

The mean number of errors per problem made on Task A, B, and C by the high A-State group and the low A-State group are presented in Table 12. It may be noted that the high A-State group made more errors in each of the three tasks than the low A-State group. The results of the three separate one-way analyses of variance in which level of A-State

(high vs. low) was the independent variable are presented in Table 13. The significant main effect of anxiety in Task B and in Task C indicated that the high A-State group made significantly more errors than the low A-State group on Tasks B and C. Although the high A-State group made slightly more errors than the low A-State group on Task A, the absence of a statistically significant main effect of anxiety in Task A indicated that this difference was not reliable.

TABLE 12.--Mean errors for high A-State and low A-State Ss in Task A, Task B, and Task C

Groups	Task A	<u>N</u>	Task B	<u>N</u>	Task C	<u>N</u>
High A-State		(29 <u>Ss</u>)		(33 <u>Ss</u>)		(29 <u>Ss</u>)
Mean	3.5		2.3		2.2	
SD	2.1		2.8		2.0	
Low A-State		(35 <u>Ss</u>)		(31 <u>Ss</u>)		(35 <u>Ss</u>)
Mean	2.9		1.1		0.8	
SD	2.1		2.1		1.3	

TABLE 13.--Summary of analysis of variance of errors for high A-State and low A-State Ss in Task A, Task B, and Task C

Source	df	Task A			Task B			Task C		
		MS	F	P	MS	F	P	MS	F	P
A-State	1	5.4	1.2		26.5	4.4	<05	30.1	11.2	<01
Error	64	4.4			6.1			2.7		

IV. DISCUSSION

In the present study, negative evaluations of CAI performance in the stress condition led to greater initial increments in A-State for HA Ss than for LA Ss. In contrast, for the nonstress condition, in which Ss were given nonevaluative information about performance, the HA and LA Ss showed almost parallel initial increases in A-State.

On the assumption that the negative feedback in the present study was interpreted as a threat to self esteem, the results are consistent with Trait-State Anxiety Theory (Spielberger et al., 1969) which predicts that HA Ss would respond with greater initial increments in A-State than LA Ss in a situation that posed a threat to self esteem.

The findings are also consistent with both previous research (Denny, 1966; Spielberger, & Smith, 1966) in which A-State reactions were inferred from performance, and with Hodges (1967) who found that HA Ss showed greater increments in A-State than LA Ss in a Failure Threat condition.

During the task a different pattern of A-State changes was observed for HA and LA Ss in the stress condition. Despite the repeated negative feedback, the level of A-State for HA Ss decreased during the task while level of A-State for LA Ss was sustained at high initial levels. This unexpected finding suggests that HA Ss adapt better than LA Ss to threats to self esteem. Since HA college

students are required to deal more frequently with their own anxiety states than LA college students, they would be more likely than LA Ss to develop mechanisms for coping with threats to self esteem.

In the nonstress condition, the HA and LA Ss showed parallel decreases in A-State during the task just as they had shown similar increases in A-State in their initial reactions to the task. The findings for the nonstress condition in the present study were essentially the same as those reported by O'Neil, Hansen, and Spielberger (1969). The tasks and procedures used by O'Neil, Hansen, and Spielberger (1969) were essentially the same as the nonstress condition in the present study except no rest periods were given in their study.

Figure 6A presents the A-State data for HA and LA Ss in the O'Neil, Hansen, and Spielberger (1969) study and comparable data from the nonstress condition in the present study (Figure 6B). For comparison purposes the A-State data for the stress condition is also shown in Figure 6. In the nonstress condition, level of A-State in the present study and the O'Neil, Hansen, and Spielberger (1969) study increased markedly from pretask levels and subsequently decreased during the task. In both studies A-State levels of HA Ss were higher than those of LA Ss throughout the task, but increments in A-State were not related to A-Trait.

In the O'Neil, Hansen, and Spielberger (1969) study, the A-State levels of HA Ss were slightly higher while the A-State levels of LA Ss were somewhat lower than were the A-State levels for the comparable groups in the present study. This finding is consistent

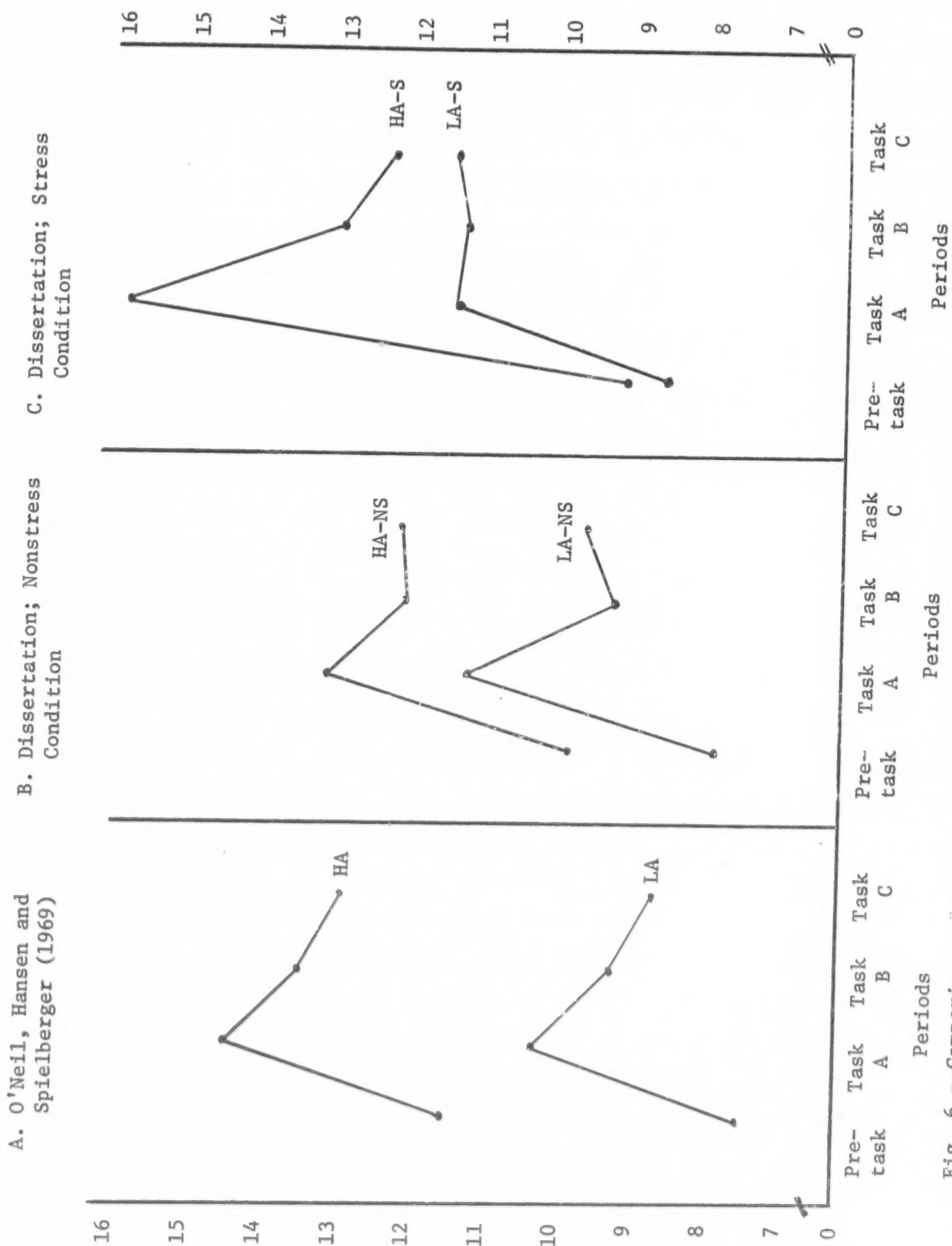


Fig. 6.---Comparison of mean A-State scores in the O'Neil, Hansen and Spielberger (1969) study and in the dissertation

with the fact that O'Neil, Hansen, and Spielberger (1969) selected Ss with more extreme A-Trait scores. The cut-off scores for HA and LA groups in their study were equivalent to the 84th and 8th percentiles in the STAI A-Trait normative groups (Spielberger et. al., 1969) in contrast to the cut-off scores of the 79th and 23rd percentile which defined the HA and LA groups in this study.

As may be seen in Figures 6A and 6B when no explicit attempt was made to introduce a threat to self esteem, there was no differential increase in A-State for Ss who differed in A-Trait. However, Figure 6C demonstrates that when stress was introduced through negative evaluations of performance, HA Ss showed greater initial increments in A-State than LA Ss and also showed a greater decline in A-State than LA Ss during the task. Thus while difficult materials presented by a computer lead to increases in A-State, these materials are no more threatening to HA Ss who are high in anxiety proneness than for LA Ss who are not easily threatened.

While similar findings were noted in the A-State data in the nonstress condition in the present study and the O'Neil, Hansen and Spielberger study (1969), very different results were obtained with regard to the relationship between A-State and errors in the two studies. O'Neil, Hansen, and Spielberger (1969) found that high A-State Ss made significantly more errors on Task A than low A-State Ss, but these groups did not differ in mean number of errors on Tasks B and C (see Figure 7A). In the present study, while the high A-State Ss tended to make more errors than low A-State Ss in each of

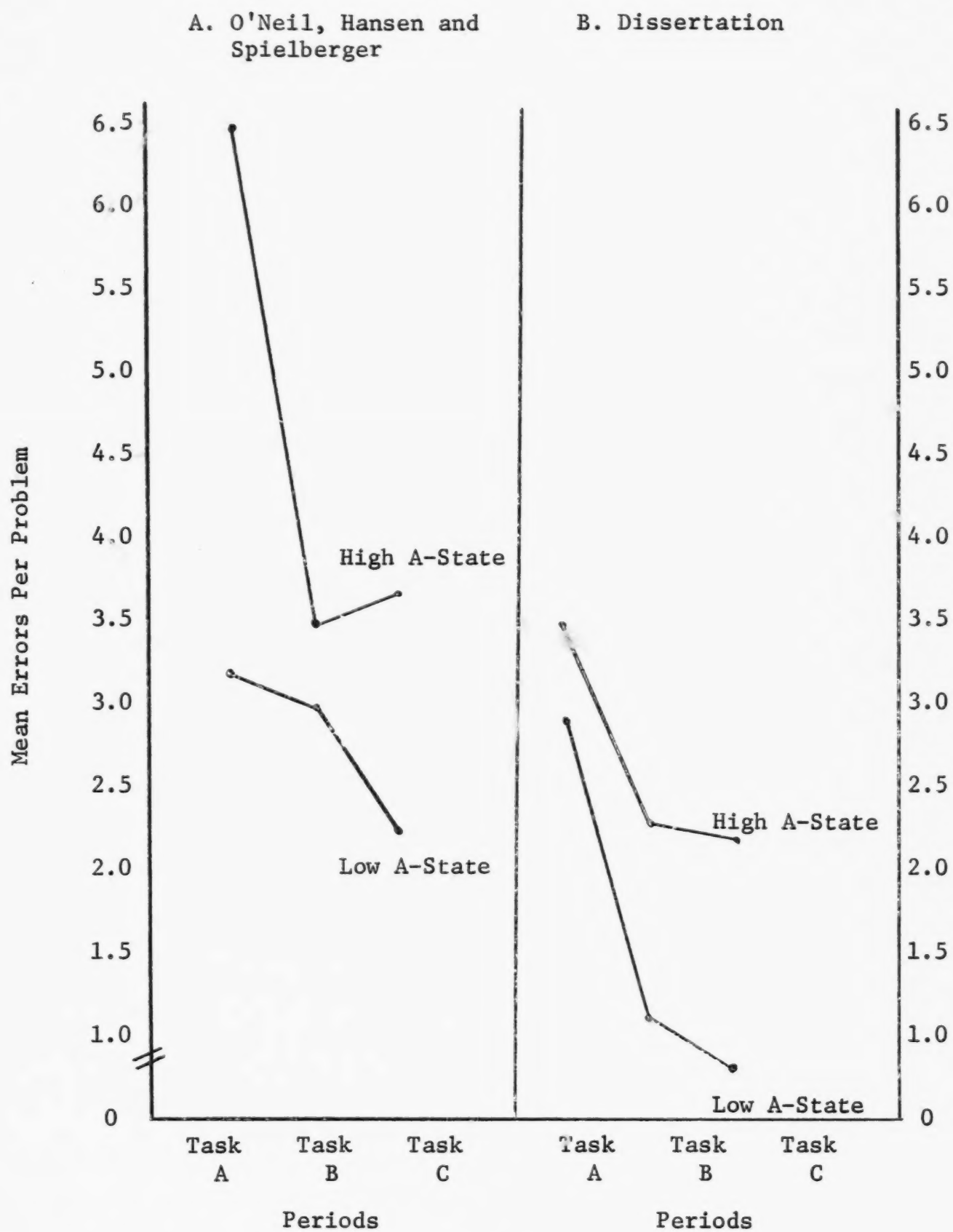


Fig. 7.--Comparison of mean errors in the O'Neil, Hansen and Spielberger (1969) study and the dissertation

the learning task, as may be noted in Figure 7B, these differences were statistically significant for Tasks B and C but not for Task A.

Drive theory would predict that high A-State Ss would make more errors than low A-State Ss on more difficult materials, in which there are many competing responses, and make fewer errors than low A-State Ss on the easier CAI materials in which there are fewer competing responses. O'Neil, Hansen, and Spielbergers' (1969) data (Figure 7A) are consistent with these predictions in that only on Task A, the task with the highest error rate, did the high A-State Ss make significantly more errors than the low A-State Ss. It is apparent, however, that the results of the present study are inconsistent with predictions derived from Drive Theory. For on the most difficult part of the CAI task, there were no differences between the high A-State and the low A-State Ss, and as the task became progressively easier, high A-State Ss made consistently more errors than low A-State Ss as may be seen in Figure 7B.

The differences in findings between those reported by O'Neil, Hansen, and Spielberger (1969) and those obtained in the present study may result from differences in procedures or the S populations used in the two studies. In the present study a stress condition was included in which female college students were Ss, O'Neil, Hansen, and Spielberger (1969) had no stress condition and used male college Ss.

Since differences between the stress and nonstress condition may have lead to the observed differences in the relationship between A-State and errors, the error data were analyzed separately for the stress and nonstress conditions. The resultant curves for high

A-State and low A-State groups in the stress and nonstress conditions were essentially the same as the combined curves shown in Figure 7B. Thus, the observed differences in the relationship between A-State and errors, in the two studies cannot be attributed to the effect of the stress condition.

The remaining difference between the two studies is the sex of the Ss in the respective studies. The present study used female Ss while O'Neil, Hansen, and Spielberger (1969) used males. Since many of the studies cited in the Introduction do not report the sex of the Ss (Montague, 1953; Spence, 1953; Taylor, & Chapman, 1955; Lucas, 1952; and Kight, & Sassenrath, 1966) it is difficult to evaluate the role of this variable on anxiety and learning.

Nevertheless, a considerable body of literature exists that documents that this relationship is different for men and women. For example, Chapeau (1966) found results consistent with Drive Theory for females but not males. Spence and Spence (1964) reported women responded at a significantly higher level than men in a standard eyelid conditioning situation. While they noted (1964, p. 139) that "a very small portion of the intersubject variance in conditioning performance is accounted for by this factor" (sex), they hypothesize that the eyelid conditioning situation aroused higher D in women than men. In two studies, Sarason (1959, 1963) found higher negative correlations between female A-Trait scores and measures of intelligence than males, but failed to replicate these findings concerning sex differences in a third study (Sarason, 1961). In contrast, Spielberger (1958) reported significant negative correlations between A-Trait and

intelligence for men, but found no relationship between A-Trait and intelligence for women. In addition, Spielberger (personal communication) has consistently used male Ss in his program of research because females have not led to systematic findings.

Katahn, in a series of anxiety and learning studies, has reported that; (1) females gave more consistent results than males (Katahn, & Dean, 1964); (2) males gave more consistent results than females (Katahn, & Branham, 1968) and (3) there were no differences between men and women (Katahn, & Lydn, 1966). Katahn and Lydn (1966) note that when sex and anxiety interactions are obtained they are probably a function of some particular situation and that caution should be used in making generalizations concerning the relationship of sex to anxiety and learning.

A similar explanation concerning the influence of situational factors is offered by Tyler (1965) to explain the superior school achievement of females as compared to males. She noted that females in school are more docile, submissive and may just "try harder" than males. The lower overall error rate in the present study as compared to the O'Neil, Hansen, and Spielberger (1969) study, might be one indicator that the females tried harder than the males. If females tend to be highly motivated on learning tasks, then the additional motivation contributed by high levels of A-State may deter performance by increasing motivation beyond the optimal level. In addition, higher levels of motivation may accentuate responses which are incompatible to the task. Thus, on the easier CAI tasks (Tasks B and C) high A-State might tend to interfere with performance instead of enhancing

it as would be predicted by Drive Theory. This explanation is consistent with Sarason's work (Sarason, 1957; Sarason, 1959; Sarason, 1961).

The findings for Task A, however, are not consistent with the above explanation. On the assumption that females are highly motivated, those with high A-State would be expected to do more poorly than low A-State Ss on Task A. But no differences were found. These findings serve to further emphasize the observation that the effects of anxiety on performance differ for females as compared to males. A number of other investigators, (e.g., Katahn & Lydn, 1966; Birney, Burdick, & Teevan, 1969), have come to similar conclusions but as yet the factors that underlie these differences are unknown.

V. SUMMARY

This study tested hypotheses about the effects of anxiety on learning derived from Spence-Taylor Drive Theory and Spielberger's Trait-State Anxiety Theory. The effects of stress on state anxiety (A-State) and on performance in a computer-assisted learning task were investigated for female introductory college students who differed in anxiety proneness (A-Trait). The Ss were selected on the basis of extreme scores on the A-Trait scale of the State-Trait Anxiety Inventory (Spielberger, et al., 1969).

Stress was induced by feedback concerning performance on a mathematical learning task which was presented by an IBM 1500 CAI system. In the stress condition, Ss received negative feedback about performance. The Ss in the nonstress condition were given a brief rest period in place of the negative feedback.

High A-Trait (HA) Ss in the stress condition showed a significantly greater initial increase in A-State from pretask levels than did the low A-Trait (LA) Ss. During the learning task, HA Ss in the stress condition showed a marked decline in A-State whereas level of A-State remained relatively constant for LA Ss. In the nonstress condition, the changes in A-State for HA and LA Ss were quite similar. Both groups showed almost the same increase in A-State from pretask levels and approximately parallel changes in the level of A-State during the learning task.

There was no relationship between A-Trait and errors on the CAI learning task. In contrast, Ss with high levels of A-State made more errors than low A-State Ss throughout the learning task. The differences in the performance of high A-State and low A-State Ss were significant on the easier sections of the CAI task, but not for the most difficult part of the task. These relationships between A-State and errors differed from previous research (O'Neil, Hansen, & Spielberger, 1969).

The findings were consistent with predictions derived from Trait-State Anxiety Theory, but not with derivations from Drive Theory. The failure to find empirical support for Drive Theory was attributed to differences in the motivational structures of men and women that affect the relationship of Drive (A-State) and performance.

APPENDICES

APPENDIX A

SHORT FORM OF THE STATE-TRAIT ANXIETY INVENTORY

APPENDIX A

SHORT FORM OF THE STATE-TRAIT ANXIETY INVENTORY

The five item A-State scale administered by the computer during the CAI learning task consisted of the items from the 20 item STAI A-State scale which had shown the highest item-remainder correlation coefficients in previous research (Spielberger, Gorsuch, & Lushene, 1969). These items were: (1) "I am tense;" (2) "I feel at ease;" (3) "I am relaxed;" (4) "I feel calm;" (5) "I am jittery." The S responded to each item by rating himself on the following four-point scale: (1) "Not at all;" (2) "Somewhat," (3) Moderately so;" (4) "Very much so."

APPENDIX B

LEARNING MATERIALS

APPENDIX B

LEARNING MATERIALS

Upon completion of the first 20 item A-State scale, each S was instructed by the computer to call an E. The E then handed the S a three page booklet called "Introduction to Complex Numbers." This booklet (see Appendix H) contained a series of definitions and examples of the field properties of complex numbers. It also contained the abbreviations the S was required to use in answering the problems which followed these materials. After the booklets had been handed to a S, the computer instructed the S in the use of the booklet in the following manner:

Materials that the proctor had just handed you are to be used as a memory aid. All of the information on sheets will be presented by the computer. Your best bet is to learn the materials from the computer if you should forget some of the materials later on refer back to the sheets--this is the purpose of the sheets.

Following these instructions the computer presented to the S the same learning materials that were in the booklet. Each S was able to progress at her own rate through the learning materials and the fifteen problems presented to her. These problems were presented in a format similar to that of the first problem shown in Figure 8. The proof statement was presented in Step 1 followed by a problem in Step 2.

- Step 1: We will show, for all pairs of elements in C , that their sum is also an element of C . To do this, we will select two arbitrary elements $Z1 = (a,b)$ and $Z2 = (c,d)$ and show that $Z1 + Z2$ is an element of C .
- Step 2: $Z1 + Z2 = (a,b) + (c,d)$ (Type the abbreviation to justify this step.)
- Step 3: The subject types "S" to indicate that the answer is SUBSTITUTION.
- Step 4: Make sure that you are using the correct abbreviation. If $R = 8$ and $S = 7$, then $8 + 7$ may be written in place of $R + S$. Try again.

Figure 8.--CAI materials format

From the abbreviations sheet in the "Introduction to Complex Numbers" booklet the Ss selected a validating property and typed her answer (Step 3). If she typed in the correct answer in this case "S" (Substitution), the computer responded "correct" and the next problem would be presented. However, if the S responded incorrectly she would be given one other example of the correct validating property (Step 4) and told to try again. The S was required to respond to each item until she gave the correct answer.

APPENDIX C

INSTRUCTIONS FOR CONTACTING Ss

APPENDIX C

INSTRUCTIONS FOR CONTACTING Ss

The following instructions were given or paraphrased to the HA and LA Ss when they were contacted in class or called individually.

Good morning! I'm Harold O'Neil, a graduate student in Psychology.

At the Computer-Assisted Instruction Center, which is located in the basement of Tully Gym, we are conducting research on the effect of computer-presentation of learning materials on the learning process. The experiment will take one to one and one-half hours. One and one-half hours of credit is being given. The experiment involves no shock, no pain, and no embarrassing questions.

We have randomly selected 80 females from Dr. Parker's and Dr. Masterton's section of Psychology 201. The names of the 80 females are on the sign-up table. Only these students may participate in the experiment. Each student, following the experiment will be shown if she wishes, the computer system in operation and the functions of the various components of the computer system.

It is essential that the students selected participate in order to maintain our random sample.

Since the computer is so expensive to operate, we have set aside only a few days (give days) to run the experiment.

The students randomly selected have to sign up for the experiment by taking one of the IBM cards which are outside the Psychology Office on the sign-up table.

The sign-up IBM cards are orange and have the CAI Center printed on them. On each card is the time when the computer is running. The student must take one of the IBM cards as a reminder of the hour for which she signed up.

If you know any of the students selected who are not here in class today, if you would remind them to pick up an IBM card for the experiment, I would appreciate it. I'd like to thank you for listening to me and again, I stress it is imperative, from our standpoint, that those students randomly selected sign up for the experiment; as in our research, a random selection of students is demanded. Thank you again.

APPENDIX D

INTRODUCTORY BOOKLET FOR NONSTRESS SUBJECTS

APPENDIX D

INTRODUCTORY BOOKLET FOR NONSTRESS SUBJECTS

COMPUTER-ASSISTED INSTRUCTION

PRESENTATION

OF

Psy 4

Prepared at

Florida State University

by

Harold F. O'Neil, Jr.

Winter Quarter, 1969

Welcome to the Computer-Assisted Instruction Center. We have developed a program that will enable you to master some fundamentals of the field properties of numbers and provide a review of compound fractions. It has been found that success in this program does not require mathematical or quantitative ability--it requires, instead, the ability to make the same kinds of abstractions and generalizations that you are expected to make in many college courses. We are interested in your reactions to this program, and we will ask you to fill out an inventory concerning your feelings at appropriate places in this program.

INTRODUCTION

To be able to communicate with the computer there are a few basic facts you need to know. You have two media at your terminal by which to enter answers to be processed by the computer: the keyboard and the light pen.

The light pen is located on the lower right side of the screen. When you use the light pen:

1. Be sure of the area you wish to touch with your light pen.
2. Press the area firmly and steadily with the light pen.
3. Withdraw the pen without dragging it across the screen.

NOTE: A "P" will appear in the lower right-hand corner of the screen when a light pen response is required. This "P" must appear before you select your answer.

The other response device is the keyboard. The keyboard has 44 keys, allowing 88 characters (44 upper-case and 44 lower-case). In addition, there are 8 function keys, such as c/r, backspace, shift, etc., and an alternate coding key. The alternate coding key, in combination with the function or with some of the regular keys, can provide an additional 38 characters.

NOTE: There are several keys that may seem similar to other keys. For example, the numeral "0" resembles the letter "O" and the numeral "1" (one) resembles the lower case "l" (el). Be careful to use the correct character in your response. Failure to do this may result in the computer analyzing your response incorrectly.

Four of the combinations of the function key and the alternate coding key will be of particular help to you. These combinations will allow you to:

1. Signal the computer that you have typed an answer and it is ready to be processed--this is the "enter" command.
2. Cancel an answer that you have typed.
3. Erase part or all of an answer you have typed.
4. Use subscripts and superscripts in your responses.

Just as with the light pen responses, in keyboard responses a "K" will appear in the lower right corner of the screen.

Now, let's discuss the features of each of the preceding combinations:

Enter command after typing in your answer.

1. Hold down the alternate coding key and, while holding it down, press the space bar.
2. Release both the alternate coding key and the space bar.

The enter command is used only when making a keyboard response.

Cancelling an answer.

If you enter an answer and make a mistake or change your mind (before using the enter command), you may cancel your response by:

1. Pressing the alterante coding key and, while pressing it, press the dash key (-).
2. Release the keys and perform the enter command.

You may then enter another response. (Cancelling may be done only before you have entered the enter command.)

Erase a letter or total answer.

If you enter one or more incorrect characters and wish to correct them:

1. Press the alternate coding key and, while holding it, press the backspace key. Press the backspace key once for each character you want to erase.
2. Release the keys, type the correct character or characters.
3. Perform the enter command.

When you are given a choice of answers, the correct answer is always present.

Remember to press the altn coding key and space bar simultaneously after completing each response. Unless this is done, the computer will not type, and you will be unable to complete the next item.

If the computer should stop for an excessive amount of time, press altn coding and the space bar simultaneously. If nothing happens, or if you have any difficulty, call the proctor.

When the "K" or "P" comes on, you do not have to respond immediately unless you wish to. The computer is patient.

If you read the screen quickly and do not wish for the computer to present new material at its own pace, press the light pen against the screen.

When you have finished these instructions, please call the proctor.

APPENDIX E

ORIENTING INSTRUCTIONS FOR THE CAI TASK

APPENDIX E

ORIENTING INSTRUCTIONS FOR THE CAI TASK

In the pretask period, after each group of Ss had read the description of the operation of the CAI terminal, the following group instructions were read.

Welcome to the Computer-Assisted Instruction Center, and thank you for coming. In this study you have volunteered for, we are interested in how well students learn materials when presented by a computer and how they feel while they are learning these materials.

You will get two hours credit for participating in the experiment even though it will take only about one and one-half hours for most of you to complete.

For those of you who are interested we will give you a tour of the computer center after the experiment and tell you something about the experiment.

Please put away your notebooks and pencils since you will not need these while you are working on the computer.

There is no smoking allowed as we have found smoking interferes with performance on this task.

Has everyone read the instructions?

APPENDIX F

STRUCTURED QUESTIONNAIRE

APPENDIX F

STRUCTURED QUESTIONNAIRE

Following the Impulsivity Scale, each S was given a questionnaire to obtain additional information for the study. This questionnaire is presented in Table 14. The numbers above the alternatives in Table 14 refer to the scoring system for each item. Subjects did not see these numbers except for Question 4. The questionnaire sampled three areas of affect or ability. First the amount of concern concerning the task (Questions 1 & 4) was evaluated. Second, the need for peer evaluation (Questions 2 & 3) was investigated. Third, degree of mathematical ability (Questions 5 & 6) was ascertained. In addition, information on age and prior knowledge concerning the experiment was collected. The results of the interview, however, are considered exploratory and suggestive due to the lack of reliability and validity data concerning the questionnaire.

The means and standard deviations for the questionnaire data for HA and LA Ss in the stress and nonstress condition are reported in Table 15. These data were separately evaluated by two-way ANOVA's in which level of A-Trait and experimental conditions were the independent variables and the interview question responses were the dependent variables.

TABLE 14.--Structured questionnaire

The answers to the following questions will be held in confidence. They are designed to allow us to make a more realistic analysis of this experiment and to improve future ones.

CIRCLE THE RESPONSE THAT MOST NEARLY REPRESENTS YOUR REACTION TO EACH OF THE STATEMENTS BELOW:

1. I was not concerned when I missed a question because no one was watching me anyway.

1	2	3	4	5
Strongly disagree	Disagree	Uncertain	Agree	Strongly agree

2. I felt uncertain as to my performance in the course relative to the performance of others.

1	2	3	4	5
Never	Occasionally	Some of the time	Most of the time	All of the time

3. In a situation where I am trying to learn something, it is important to me to know where I stand relative to others.

1	2	3	4	5
Quite often	Often	Occasionally	Seldom	Very seldom

4. How much concern about your performance did you have?

Rate on a 5 point scale:

1	2	3	4	5
Very little concern				Very much concern

5. Relative to other college students, rate your mathematical ability in one of the following terms:

1	2	3
Below average	Average	Above average

6. List the title and numbers of mathematics courses that you have taken, are taking, or have exempted on the college level.

TABLE 14.--Continued

-
-
7. How old are you?
8. Had you heard anything about the experiment prior to participating in it?
-

TABLE 15.--Means of interview data for HA and LA Ss in the stress and nonstress conditions

Groups	Questions						
	1	2	3	4	5	6	7
All Groups							
Mean	2.4	2.8	2.8	3.6	2.1	2.4	18.8
SD	1.1	1.2	1.1	1.2	0.6	2.2	1.0
HA Stress							
Mean	1.9	2.8	2.8	3.8	2.1	2.0	18.7
SD	1.1	1.1	1.3	1.2	0.7	1.7	0.8
HA Nonstress							
Mean	1.7	3.4	2.6	4.1	2.0	2.9	18.4
SD	0.8	1.1	1.0	0.8	0.4	2.5	0.7
LA Stress							
Mean	2.6	3.0	3.1	3.1	2.1	2.5	19.3
SD	1.2	1.3	1.2	1.5	0.6	2.3	1.2
LA Nonstress							
Mean	2.4	2.2	2.7	3.5	2.2	2.2	19.0
SD	1.2	1.1	0.6	1.0	0.7	2.2	0.9

HA Ss irrespective of experimental condition responded on both the first and fourth interview question (Table 15) that they were more concerned than LA Ss about their performance on the CAI task. The results of the ANOVA presented in Table 16 indicated that these differences between HA and LA Ss were reliable.

TABLE 16.--Summary of analyses of variance of concern about performance for HA and LA Ss in the stress and nonstress conditions

Source	df	A. Question 1			B. Question 4		
		MS	F	P	MS	F	P
A-Trait (A)	1	8.3	5.9	<05	7.6	5.9	<05
Conditions (C)	1	0.4	<1		2.3	1.8	
A x C	1	0.01	<1		0.1	<1	
Error	60	1.2			1.3		

Although there was no significant differences between HA and LA Ss with regard to expressed interest in receiving feedback about performance relative to others (Table 17B), the HANS Ss were the most concerned about their performance relative to others (Table 16). The significant A-Trait by conditions interaction in Table 17A indicated that this finding was reliable.

TABLE 17.--Summary of analyses of variance of need for peer evaluation for HA and LA Ss in the stress and nonstress condition

Source	df	A. Question 2			B. Question 3		
		MS	F	P	MS	F	P
A-Trait (A)	1	3.5	2.5		04	<1	
Conditions (C)	1	0.2	<1		1.3	1.2	
A x C	1	8.3	5.9	<05	0.2	<1	
Error	60	1.4			1.1		

HA and LA Ss did not differ with regard to number of mathematics courses taken, nor rated mathematical ability as is shown in Table 18 by the absence of any statistical effect of A-Trait or conditions on these variables.

TABLE 18.--Summary of analyses of variance of degree of mathematical ability for HA and LA Ss in the stress and nonstress condition

Source	df	A. Question 5			B. Question 6		
		MS	F	P	MS	F	P
A-Trait (A)	1	0.2	.1		0.3	.1	
Conditions (C)	1	0.01	.1		1.6	.1	
A x C	1	0.2	.1		6.3	1.3	
Error	60	0.7			4.8		

APPENDIX G

LATENCY DATA

APPENDIX G

LATENCY DATA

Latencies were obtained for both correct answers (CA) and wrong answers (WA) in the three sections of the CAI learning task. Latency is defined by the IBM 1500 system as consisting of the elapsed time from the presentation of a stimulus to the completion of a response. Correct and wrong answer latencies were first separately analyzed as a function of A-Trait and experimental conditions; then the relationships between A-State and CA and WA latencies were evaluated.

Correct Answer Latencies

Effect of A-Trait and Conditions on CA Latencies

The means and standard deviations for the CA latencies in the three sections of the learning task for HA and LA Ss in the stress and nonstress conditions are given in Table 19. These data were evaluated by a three-factor ANOVA with repeated measures in which A-Trait, conditions and periods were the independent variables and the mean CA latency per problem in each section was the dependent variable. Table 20 presents the results of this analysis in which both the triple interaction of A-Trait conditions and periods and the main effect of periods were significant. The triple interaction is shown in Figure 9 which indicates that on Task A both LA-NS Ss had HA-S Ss responded with

slower latencies than LA-S Ss and HA-NS Ss. However, in Task B, LA-NS Ss responded with the quickest latencies compared to the other three groups. Finally in Task C all four groups of Ss responded about the same. As may also be seen in Figure 9, CA latencies decreased as the learning materials became easier.

Since level of A-State was an important determinant of errors on the CAI task, the next analysis focused on the effects of A-State on CA latencies in the three sections of the learning task.

TABLE 19.--The mean CA latencies for HA and LA Ss in the stress and nonstress conditions in Task A, Task B, and Task C

Groups	Task A	Task B	Task C
All groups			
Mean	33.6	31.2	26.8
SD	16.8	16.0	12.6
HA Stress			
Mean	36.3	32.6	27.6
SD	16.9	14.0	11.0
HA Nonstress			
Mean	28.4	31.1	26.7
SD	14.5	16.6	16.7
LA Stress			
Mean	30.9	32.6	27.6
SD	10.8	15.2	12.5
LA Nonstress			
Mean	38.8	28.7	25.4
SD	22.5	19.1	10.4

(N=16 for each group)

TABLE 20.--Summary of the analysis of variance of CA latencies for HA and LA Ss in the stress and nonstress condition in Task A, Task B, and Task C

Source	df	MS	F	P
A-Trait (A)	1	2.1	<1	
Conditions (C)	1	96.9	<1	
A x C	1	195.2	<1	
Error (b)	60	470.5		
Periods (P)	2	756.0	6.2	<.01
A x P	2	63.3	<1	
C x P	2	29.5	<1	
A x C x P	2	411.2	3.4	<.05
Error (w)	120	121.2		

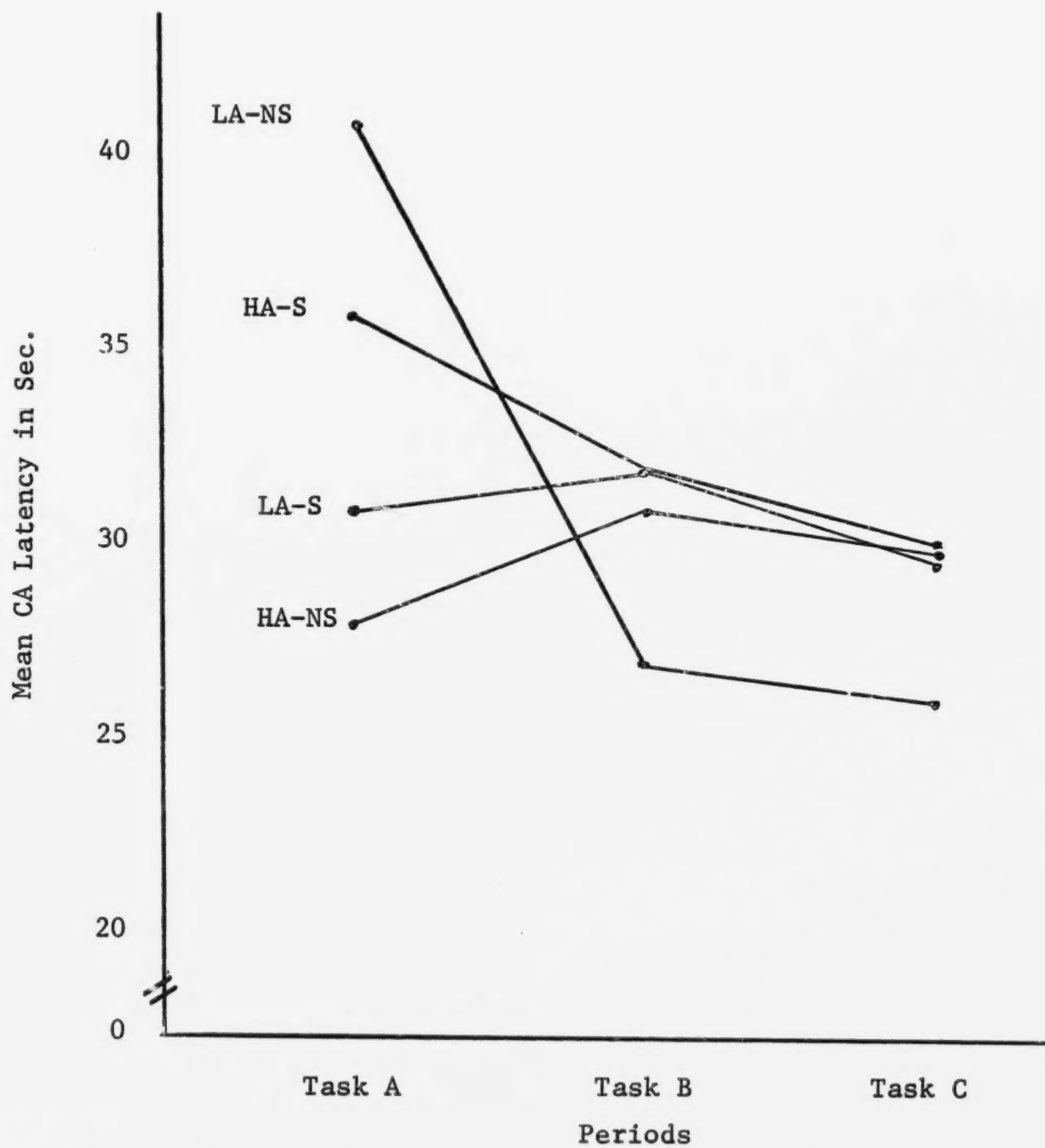


Fig. 9.--Mean CA latency for HA and LA Ss in the Stress and Nonstress conditions for Task A, Task B and Task C

Effect of Level of A-State on
CA Latencies

CA latencies for Tasks A, B, and C were separately analyzed as a function of level of A-State. Three separate one-way analyses of variance were computed in which level of A-State (high vs. low) was the independent variable and CA latency was the dependent variable. For each task, high and low A-State groups were defined by the median split of the A-State scores obtained within that task. These high and low A-State groups were exactly the same as the high and low A-State groups of the error analyses.

Table 21 presents the means and standard deviations for the mean CA latencies per problem made by the high A-State group and the low A-State group on Tasks A, B, and C. It may be noted that high A-State and low A-State Ss responded about the same on all three sections of the learning task. Results of the three separate one-way analyses of variance for these data are presented in Table 22. The lack of a significant main effect in either Task A, Task B, or Task C indicated that there were no reliable difference between high A-State Ss and low A-State Ss with regard to CA latency responding.

TABLE 21.--Mean CA latencies for high A-State and low A-State Ss in Task A, Task B, and Task C

Group	Task A	Task B	Task C
High A-State			
Mean	34.0	31.5	25.0
SD	19.2	15.2	10.1
Low A-State			
Mean	33.3	31.0	28.4
SD	14.9	17.1	14.3

TABLE 22.--Summary of analyses of variance of CA latencies for high A-State and low A-State Ss in Task A, Task B, and Task C

Source	df	Task A			Task B			Task C		
		MS	F	P	MS	F	P	MS	F	P
A-State	1	6.4	<1		4.7	<1		182.5	1.2	
Error	62	288.3			260.9			158.6		

Wrong Answer Latencies

Since some Ss did not make any errors on Task B and/or Task C, they had no WA latencies for these sections. The 17 Ss having no errors and therefore no WA latencies on Task B and/or C were dropped from the WA latency analyses.

Effect of A-Trait and Conditions on WA Latencies

The means and standard deviations of the WA latencies for HA and LA Ss in the stress and nonstress conditions for Task A, Task B, and Task C are given in Table 23. These data were evaluated by a three-factor ANOVA with repeated measures in which A-Trait, conditions and periods were the independent variables while mean WA latency per

problem for each task was the dependent variable. In order to utilize a repeated measures program, eight Ss (five LA-S Ss and three HA-NS Ss) were randomly dropped in order to provide proportional n. Table 24 presents the results of this analysis in which the triple interaction of A-Trait conditions and periods is significant as was the main effect of periods. This triple interaction, presented in Figure 10, shows that on Task A while the HA-S Ss had longer latencies than the HA-NS Ss, the LA-NS Ss and LA-S Ss responded similarly and both of these groups responded slower than the HA-S Ss and the LA-NS Ss. Finally, by Task C the four groups of Ss had similar WA latencies. In general, WA latencies decreased as the CAI task became easier.

As level of A-State was an important determiner of errors, the next analysis focused on the effects of A-State on WA latencies in the three sections of learning tasks.

TABLE 23.--The mean WA latencies for HA and LA Ss in the stress and nonstress conditions in Task A, Task B, and Task C

Groups	Task A (N)	Task B (N)	Task C (N)
All groups	(64 <u>Ss</u>)	(53 <u>Ss</u>)	(54 <u>Ss</u>)
Mean	56.6	41.7	30.9
SD	32.3	30.9	20.2
HA stress	(16 <u>Ss</u>)	(12 <u>Ss</u>)	(13 <u>Ss</u>)
Mean	71.8	43.0	40.3
SD	47.7	35.2	28.5
HA nonstress	(16 <u>Ss</u>)	(14 <u>Ss</u>)	(13 <u>Ss</u>)
Mean	44.7	44.0	28.4
SD	15.4	30.5	22.0
LA stress	(16 <u>Ss</u>)	(14 <u>Ss</u>)	(16 <u>Ss</u>)
Mean	48.7	43.4	27.1
SD	15.1	28.6	12.5
LA nonstress	(16 <u>Ss</u>)	(13 <u>Ss</u>)	(12 <u>Ss</u>)
Mean	61.2	36.2	28.4
SD	33.4	25.6	13.8

TABLE 24.--Summary of analysis of variance of WA latencies for HA and LA Ss in the stress and nonstress conditions in Task A, Task B, and Task C

Source	df	MS	F	P
A-Trait (A)	1	195.3	<1	
Conditions (C)	1	9.5	<1	
A x C	1	2.5	<1	
Error (b)	34			
Periods	2	4027.9	13.2	<.01
A x P	2	268.9	<1	
C x P	2	7.6	<1	
A x C x P	2	1153.6	3.8	<.05
Error (w)	68			

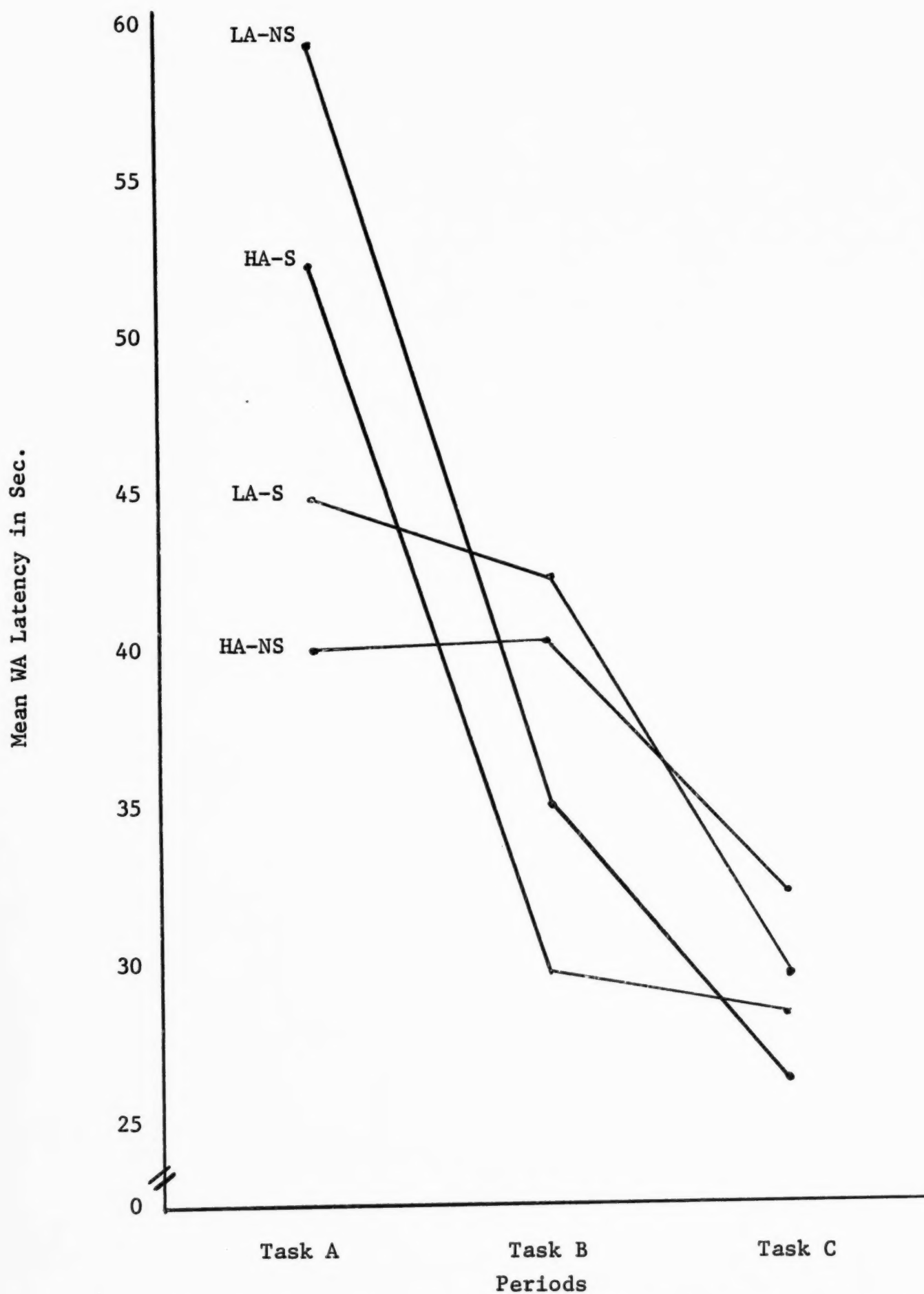


Fig. 10.--Mean WA latency for HA and LA Ss in the Stress and Nonstress conditions for Task A, Task B, and Task C

Effects of Level of A-State on
WA Latencies

WA latencies for Tasks A, B, and C were separately analyzed as a function of A-State. For each task, the high and low A-State groups were exactly the same as for the CA latency analyses. Three one-way analyses of variance were computed for the WA latency data with level of A-State (High vs. Low) the independent variable.

Table 25 gives the means and standard deviations of WA latencies for the two A-State groups on Tasks A, B, and C. It may be noted that High A-State Ss had longer latencies on Task A and B compared to the low A-State Ss. There were no differences between High and Low A-State Ss on Task C. However, the results of the separate ANOVA's presented in Table 26 indicated that these differences were not statistically significant. The lack of a significant main effect of A-State in either Task, Task B, or Task C indicated that there was no reliable difference between the High A-State and Low A-State Ss with regard to WA latency responding.

In summary, both CA and WA latencies decreased from Task A to Task C. CA and WA latencies were influenced by complex interaction between A-Trait, conditions and periods. However, there was no effect of level of A-State on either CA or WA latencies.

TABLE 25.--Mean WA latencies for high A-State and the low A-State Ss in Task A, Task B, and Task C

Groups	Task A (<u>N</u>)	Task B (<u>N</u>)	Task C (<u>N</u>)
High A-State	(29 <u>Ss</u>)	(31 <u>Ss</u>)	(26 <u>Ss</u>)
Mean	64.2	45.3	29.4
SD	42.7	31.6	14.7
Low A-State	(35 <u>Ss</u>)	(22 <u>Ss</u>)	(27 <u>Ss</u>)
Mean	50.3	36.6	29.5
SD	17.9	25.7	20.0

TABLE 26.--Summary of the analyses of variance of WA latencies for high A-State and low A-State Ss in Task A, Task B, and Task C

Source	Task A				Task B				Task C			
	df	MS	F	P	df	MS	F	P	df	MS	F	P
A-State	1	3076.1	3.1		1	991.3	1.2		1	.1	<1	
Error	62	1001.1			51	858.0			51	309.2		

APPENDIX H

INTRODUCTION TO COMPLEX NUMBERS

APPENDIX H

INTRODUCTION TO COMPLEX NUMBERS

The following learning materials (in booklet form) were given to each S immediately after the prerask A-State measure.

NOTATION: Because of limitations of the typewriter keyboard, it is sometimes necessary to use a certain convention for multiplication and exponentiation. The "*" is often used. So when you see expressions such as " $a*b$ " and " $a**2$ " you should recognize them as "a times b" and "a squared" respectively. However, many times for multiplications "a times b" will simply be "ab".

Definition: A complex number Z is an ordered pair of real numbers (a,b) . Likewise for all real numbers, a and b , each ordered pair (a,b) is a complex number Z .

Examples of complex numbers are $(6,5)$, $(1/2,-1)$ and $(4,3**1/2)$.

Definition of Equality:

Two complex numbers are equal if and only if they have the same first component and the same second component. That is, if $Z_1=(a,b)$ and $Z_2=(c,d)$, $Z_1=Z_2$ if and only if $a=c$ and $b=d$.

$(-3,5)=(-6/2,4+1)$ since $-3=-6/2$ and $5=4+1$ $(4,7)$ does not equal $(7,4)$ since 4 does not equal 7

You have previously learned that the set of real numbers, R , together with the operations of addition and multiplication forms a field.

If we denote the set of complex numbers by C and define some type of addition and multiplication on C , we can then determine if this new system satisfies the field Postulates.

Before we define addition and multiplication of complex numbers, we'll have a brief review of the properties that characterize a field, and we will see why R under addition and multiplication satisfies each property of a field.

1. Closure for addition: For every a, b in R , $a+b$ is also in R
2. Commutativity with respect to addition: For every a, b in R ,
 $a+b=b+a$

3. Associativity with respect to addition: For every a, b and c in R
 $(a+b)+c=a+(b+c)$
4. Additive identity: 0 is the additive identity for R since for every a in R $a+0=0+a=a$
5. Additive inverse: For every a in R , $-a$ is the additive inverse since $a+(-a)=-a+a=0$
6. Closure under multiplication: For every a, b in R ab is also in R
7. Commutativity with respect to multiplication: For every a, b in R , $ab=ba$
8. Associativity with respect to multiplication: For every a, b and c in R , $(ab)c=a(bc)$
9. Multiplicative identity: $1/a$ is the multiplicative identity for R since for every a in R , $a*1=1*a=a$
10. Multiplicative inverse: $1/a$ is the multiplicative inverse for every a in R except 0 since $1/a*a=a*1/a=1$
11. Multiplication is distributive over addition: For every a, b and c in R , $a(b+c)=ab+ac$

This completes the review of the field properties for real numbers. Our next task is to verify that C , the set of complex numbers under the operations of addition and multiplications, is a field.

Before checking the field properties for C , it is necessary to make certain definitions.

Definition of addition in C : For all complex numbers, Z_1 and Z_2 , and all real numbers, a, b, c , and d , if $Z_1=(a,b)$ and $Z_2=(c,d)$, then $Z_1+Z_2=(a+c, b+d)$.

Example: $(3,4)+(2,7)=(5,11)$.

Definition of multiplication in C : For all complex numbers, Z_1 and Z_2 , and for all real numbers a, b, c , and d , if $Z_1=(a,b)$ and $Z_2=(c,d)$, then $Z_1Z_2=(ac-bd, ad+bc)$.

For example, $(3,7)(5,2)=(15-14, 6+35)=(1,41)$.

We will now present 11 proofs to establish that C under addition and multiplication is a field.

You are to supply the abbreviation for the reason that justifies each step in each of the 11 proofs.

These abbreviations are on the sheet of paper called ABBREVIATIONS.

Remember that the correct answer has to be one of the reasons.

So keep trying them if you are using a wrong abbreviations. GOOD LUCK.

ABBREVIATIONS

The following abbreviations should be used for the reasons required for the proofs of the field properties for complex numbers.

Abbreviation

cra	Closure in R under addition
crm	Closure in R under multiplication
cca	Closure in C under addition
ccm	Closure in C under multiplication
ca	Commutativity with respect to Addition in R
cm	Commutativity with respect to Multiplication in R
aa	Associativity with respect to Addition in R
am	Associativity with respect to Multiplication in R
rt	Rearrangement of Terms in R
dma	Distributivity of Multiplication over Addition in R
dc	Definition of a Complex Number-An Ordered Pair of Real Numbers
da	Definition of Addition in C
ds	Definition of Subtraction in C
dm	Definition of Multiplication in C
dd	Definition of Division in C
de	Definition of Equality in C
s	Substitution of terms
ar	Addition in R
sr	Subtraction in R
mr	Multiplication in R
dr	Division in R
tr	Transitive property for real numbers

Abbreviation (Continued)

c	Cancellation in R
tt	Transposition of Terms

APPENDIX I

CORRELATIONAL ANALYSES

APPENDIX I

CORRELATIONAL ANALYSES

In order to further investigate the relationships between the independent and dependent variables, each variable was correlated with every other variable. The results of the correlational procedure are presented in Table 27. The scoring of several variables, such as experimental conditions and the interview questions requires comment. The stress condition was assigned the value one while the nonstress condition was assigned the value two. The exact scoring systems for the interview questions are presented in detail in Appendix F.

Four sets of relationships were investigated by means of the correlational procedure: First, the relationships between A-Trait, experimental conditions and ability or prior knowledge variables with the five short form A-State scales were examined. The prior knowledge or ability variables were: critical thinking, number of collegiate mathematics courses and rated mathematical ability. Second, the relationships between A-Trait, A-State, experimental conditions and prior knowledge variables as related to Task A, B, and C errors was investigated. Third, the relationship between A-Trait, A-State, experimental conditions, prior knowledge variables and errors with both CA and WA latency was examined. Finally, the consistency of Ss' responding on each of the dependent variables was investigated. The relevant correlations which dealt with the above sets of relationships were extracted from Table 27 and separately tabled.

TABLE 27.--Correlation matrix between all variables.

Variable	No.	1	2	3	4	5	6	7	8	9	10	11	12
A-Trait	1.	1.00	-11	30*	23	54**	41**	26*	41**	38**	06	74**	04
Conditions	2.		1.00	-06	01	-20	-20	-12	-25*	-20	-02	-09	-21
Pretask A-State	3.			1.00	89**	51**	58**	52**	-25*	-15	08	20	08
Short Form Pretask A-State	4.				1.00	56**	59**	54**	54**	56**	13	15	-10
Task A A-State	5.					1.00	83**	64**	68**	72**	13	43**	-03
Task B A-State	6.						1.00	84**	81**	83**	-01	37**	-06
Task C A-State	7.							1.00	80**	86**	04	23	-19
Posttask A-State	8.								1.00	92**	-02	32**	-14
Short Form Posttask A-State	9.									1.00	06	32**	-14
Impulsivity	10.										1.00	11	-24
Prior A-State	11.											1.00	-01
Critical Thinking	12.												1.00
Interview Question 1	13.												
Interview Question 2	14.												
Interview Question 3	15.												
Interview Question 4	16.												
Rated Math Ability	17.												
No. of Math Courses	18.												
Age	19.												
Task A errors	20.												
Task B errors	21.												
Task C errors	22.												
Task A CA Latency	23.												
Task B CA Latency	24.												
Task C CA Latency	25.												
Task A WA Latency	26.												
Task B WA Latency ¹	27.												
Task C WA Latency ²	28.												

*p < .05

¹n=53

(n=64)

**p < .01

²n=54

[illegible]

The correlations of various independent variables with the five A-State measures obtained during the CAI task were extracted from Table 27 and are presented in Table 28. A-Trait was related to all A-State measures except pretask A-State. HA Ss responded consistently with higher levels of A-State than LA Ss throughout the task as indicated by the significant positive correlations between A-Trait and A-State. Rated mathematical ability was related only to the A-State measured during Task B. Neither conditions (stress, nonstress), critical thinking nor number of mathematics courses were related to any A-State measure.

TABLE 28.--Correlations of selected variables with the A-State measures

Variables	A-State Measures				
	Pretask	Task A	Task B	Task C	Posttask
A-Trait	.23	.54**	.41**	.26*	.38**
Experimental Conditions	.01	-.20	-.20	-.12	-.20
Critical Thinking	-.10	-.03	-.06	-.19	-.14
No. of Math Courses	-.14	-.10	-.14	-.17	-.16
Rated Math Ability	-.16	-.21	-.26*	-.18	-.18

* $p < .05$

** $p < .01$

($n = 64$)

The correlations between errors on the CAI task and various independent variables are presented in Table 29. There were no significant effects of A-Trait or conditions on mean number of errors. However, Ss who scored high on the critical thinking test made fewer errors on Tasks A and C than Ss scoring low on this test as indicated

by the significant negative correlations between critical thinking scores and errors. Similarly, Ss with more mathematics courses made fewer errors on Tasks B and C than Ss with few mathematics courses while Ss who rated themselves having above average mathematical ability made fewer errors on all three sections of the learning task. Only A-State measured within Task C was related to errors with the same task. On Task C high A-State Ss made more errors than low A-State Ss.

TABLE 29.--Correlations of selected variables with mean number of errors in the three sections of the learning task

Variables	Mean Errors		
	Task A	Task B	Task C
A-Trait	04	13	07
Experimental Conditions	05	03	03
Critical Thinking	-30*	-14	-26*
No. of Math Courses	-21	-35**	-25**
Rated Math Ability	-26*	-33**	-31**
Task A A-State	16	18	15
Task B A-State	25*	23	23
Task C A-State	20	23	44**

* $p < .05$

** $p < .01$
($n = 64$)

In Table 30, the correlations of various variables with both CA and WA latencies are reported. It may be noted that of all the selected independent variables only errors were significantly related

to CA latency. The significant negative correlations between Task A and Task C errors with CA latency within the same task indicated that Ss who made few errors on Task A and Task C also responded slowly when choosing the correct answer. Similarly, Ss who made few errors also responded slowly when making the errors as denoted by the significant negative correlation between errors and WA latency in Task A, B, and C. In addition Ss who had more mathematics courses took longer to respond when making errors in Task A and Task B than Ss with few mathematics courses, as denoted by the significant positive correlations between numbers of mathematics courses and Task A and B WA latencies.

TABLE 30.--Correlations of selected variables with CA and WA latencies in the three sections of the learning task

Variables	CA latency			WA latency		
	Task A	Task B	Task C	Task A	Task B	Task C
A-Trait	-04	02	02	05	12	12
Conditions	00	-09	-06	-11	-05	-11
Critical Thinking	10	02	14	14	07	04
No. of Math Courses	-04	02	-11	26*	26*	00
Rated Math Ability	-10	-09	-04	01	07	06
Task A A-State	06	12	02	24	09	14
Task B A-State	-11	00	03	-08	20	04
Task C A-State	-13	-08	-09	-09	05	-04
Task A errors	-44**	-11	-17	-45**	-19	-11
Task B errors	-15	-23	-20	-16	-39**	-15
Task C errors	-26*	-11	-26*	-26*	-28*	-37**

* $p < .05$
 ** $p < .01$

¹(n=64)
¹n=53

²n=54

In order to investigate how consistently students responded on the dependent variables, each dependent variable measured in Task A was correlated with its subsequent value in Task B (r_{AB}). Likewise, the value of each of the dependent variables on Task B was correlated with its subsequent value on Task C (r_{BC}). Finally, performance in Task A was correlated with performance in Task C (r_{AC}). These correlations were abstracted from Table 27 and are presented in Table 31. As may be seen in Table 31, all the correlations, except for WA latency (r_{AB}) were significant. The significant positive correlations indicated that students responded consistently throughout the task on each of the dependent variables.

TABLE 31.--Intercorrelations of selected variables in the three sections of the learning task

Variables	r_{AB}	r_{BC}	r_{AC}
Mean Errors	43**	51**	52**
CA Latencies	59**	52**	30*
WA Latencies	15 ¹	49** ¹	37** ²
A-State	83**	84**	65**

* $p < .05$

** $p < .01$

($n = 64$)

¹ $n = 53$

² $n = 54$

APPENDIX J

RAW DATA

APPENDIX J

RAW DATA

In this appendix, the raw data for high A-Trait and low A-Trait Ss in the stress and nonstress conditions are presented. In Table 32 all values of the variables used in this study are shown. In this table, the student number refers to each S's identification number on the IBM 1500 system. Following the CAI number each S's A-Trait score and scores on the 20-item A-State scales given before (pre) and after (post) the experimental session are given. Next, the scores on the five A-State scales measured before the experimental session during the three sections of the learning task (A, B, and C) and after the experimental session are presented. These data are followed by the mean number of errors per problem on Tasks A, B, and C. Then the mean correct answer latency per problem for the same three sections of the learning task are given. These data are followed by the mean wrong answer latency per problem measured during these three periods. In the columns labeled Other Test Data, each S's score on the Impulsivity scale, the A-State scale given before the experiment (prior A-State), and the Critical Thinking test are given. Each S's responses on the interview questions are given next. Finally, the classification of each S as to her A-State level on Task A, B, and C are given.

The reader must note that the mean number of errors per problem and both the mean correct answer latency per problem and the mean wrong answer latency per problem are expressed in tenths. For example, for S P06 the mean errors per problem in Task A is read as 06.8. In addition for the wrong answer latency data, a -2 for piece of data indicates that the S had no incorrect answers for that task and thus there was no wrong answer latencies for that task.

TABLE 32.--Raw data for high A-Trait and low A-Trait Ss in the stress and nonstress conditions

Student Number	A-Trait Score	20-Item A-State		5-Item A-State					Errors			CA Latency			WA Latency		
		Pre	Post	Pre	A	B	C	Post	A	B	C	A	B	C	A	B	C
High A-Trait/Stress																	
P106	60	67	74	17	20	20	20	20	068	024	008	122	253	114	0309	0211	0403
P115	52	35	33	07	11	08	09	09	012	004	006	186	255	340	0455	0355	0250
P119	55	35	45	07	17	13	10	11	034	026	004	151	291	379	0521	0251	0319
P125	63	47	53	14	19	16	14	14	024	106	028	433	391	333	0882	0250	0366
P128	50	35	51	08	17	16	13	12	026	000	002	530	521	268	1033	-002	0204
P132	66	30	40	08	12	12	10	10	006	000	000	265	285	137	0312	-002	-002
P134	46	36	45	07	10	08	12	11	024	002	032	503	325	261	0628	0244	0310
P139	49	33	58	06	16	16	12	14	042	004	004	249	301	400	0630	1510	1062
P175	60	35	44	12	18	12	07	12	032	014	000	596	318	207	0939	0514	-002
M204	56	54	48	18	19	18	19	12	044	060	054	212	145	140	0702	0293	0341
M211	51	32	26	08	18	09	09	08	006	000	004	623	613	367	2164	-002	0402
M213	56	35	69	08	20	20	17	20	052	064	030	349	310	437	0445	0424	0328
M216	53	30	58	06	15	13	15	13	020	006	030	309	173	282	0436	0361	0158
M218	45	31	35	09	14	06	07	09	014	000	004	621	600	295	1275	-002	0966
M236	46	21	38	05	14	12	12	10	022	002	000	310	205	372	0414	0439	-002
M244	46	39	53	07	14	12	12	12	058	020	018	348	229	091	0347	0310	0128
High A-Trait/Nonstress																	
P107	50	57	71	19	20	20	20	20	026	054	032	214	109	121	0375	0165	0132
P120	50	35	34	06	12	10	06	08	008	000	000	274	375	327	0683	-002	-002
P123	47	36	42	09	11	12	11	10	066	014	016	236	290	395	0279	0748	0246
P126	51	43	41	10	15	12	13	12	028	012	024	240	225	288	0456	0272	0742
P129	45	26	34	05	12	09	09	09	068	012	002	189	599	600	0580	0310	0880
P137	49	45	48	14	12	13	15	12	050	032	042	230	136	095	0301	0179	0109
P142	54	32	56	08	14	13	15	14	090	048	068	174	530	099	0209	0169	0160
P176	50	45	42	13	19	18	11	09	068	002	002	249	353	241	0210	0669	0280
M220	46	49	58	12	15	13	14	14	046	032	056	183	380	258	0464	0329	0173
M223	51	21	31	05	12	10	13	10	058	006	012	162	118	101	0307	0404	0186
M227	45	40	38	13	13	14	15	10	010	024	008	400	559	379	0599	0540	0430
M234	46	33	43	07	11	11	14	13	010	004	010	251	190	247	0553	0480	0556
M235	51	35	38	08	13	10	11	11	018	004	008	260	125	200	0438	0447	0112
M239	46	50	38	15	12	10	10	10	002	000	000	422	177	177	0463	-002	-002
M240	49	38	38	09	09	09	10	11	032	052	022	312	333	113	0598	0175	0192
M243	66	36	39	08	13	13	11	10	010	002	000	753	477	629	0635	1278	-002
Low A-Trait/Stress																	
P105	29	31	55	08	14	13	16	15	060	008	050	211	334	171	0243	0595	0164
P109	27	34	34	08	09	10	10	10	016	004	002	305	569	528	0628	1224	0222
P117	30	28	30	07	10	10	10	09	026	004	006	272	176	282	0490	0384	0216
P122	31	37	45	09	11	12	13	12	054	106	016	374	178	308	0451	0199	0339
P131	31	23	28	05	07	05	05	05	016	000	006	323	387	242	0414	-002	0239
P135	31	34	39	09	11	11	10	10	024	022	008	201	087	066	0319	0177	0305
P144	30	32	28	05	10	09	10	06	018	000	004	525	368	177	0629	-002	0299
P145	30	29	26	08	12	10	08	07	006	004	006	535	468	324	0785	0180	0233
P170	30	28	40	05	12	11	12	10	044	002	002	238	287	252	0585	0721	0580
P110	31	60	77	18	18	18	20	20	040	002	058	348	443	297	0465	0634	0141
M207	29	36	37	10	12	12	09	09	058	006	008	297	513	468	0376	0262	0389
M221	23	55	48	10	10	12	11	09	060	006	042	320	533	447	0484	0313	0259
M229	28	35	31	12	12	11	11	09	016	002	002	314	194	125	0247	0240	0143
M230	29	24	30	06	13	13	11	09	022	012	004	154	263	205	0658	0355	0226
M245	31	46	50	13	13	13	14	14	034	004	002	173	114	205	0436	0468	0113
M246	28	24	48	06	11	14	16	12	006	008	006	357	304	315	0577	0317	0468
Low A-Trait/Nonstress																	
P111	30	27	27	06	10	08	07	07	028	000	000	186	318	355	0758	-002	-002
P113	28	42	33	11	11	05	05	05	030	006	004	191	207	200	0671	0215	0202
P116	25	32	34	11	12	11	12	11	026	020	000	396	167	284	0554	0377	-002
P121	21	26	28	06	08	05	07	05	070	072	052	265	116	123	0234	0140	0077
P127	31	23	40	05	11	10	16	09	006	000	026	351	262	316	0735	-002	0351
P133	27	41	49	13	20	17	20	17	020	014	008	866	716	371	1481	0477	0419
P138	29	41	41	12	13	13	13	13	014	002	002	263	236	279	0062	0961	0541
M203	31	27	27	07	12	09	08	08	018	012	000	791	665	163	0481	0675	-002
M205	28	37	36	10	11	11	10	10	014	002	004	467	324	239	0487	0523	0328
M212	30	35	25	09	10	08	08	06	032	002	010	182	157	065	0208	0375	0097
M217	23	25	27	05	08	05	05	06	018	002	000	598	521	316	0933	0133	-002
M224	24	22	25	05	07	05	05	08	060	086	040	223	074	121	0274	0077	0167
M225	27	31	32	08	10	08	07	07	020	002	002	658	315	404	0726	0189	0220
M226	26	25	26	05	11	07	07	06	018	000	002	262	228	300	0393	-002	0404
M228	29	27	43	07	17	16	15	13	064	038	010	171	122	160	0242	0135	0310
M231	29	31	38	08	13	12	11	11	022	022	018	334	162	373	0950	0429	0287

Table 32.--Continued

Other Test Data		Critical Thinking	Interview Questions							A-State Classification		
Impulsivity	Prior A-State		1	2	3	4	5	6	7	A	B	C
15	52	53	4	4	2	2	3	00	18	Hi	Hi	Hi
14	55	84	1	2	3	4	2	03	18	Lo	Lo	Lo
09	39	70	2	1	5	4	3	04	19	Hi	Hi	Lo
12	49	63	2	1	4	1	1	00	18	Hi	Hi	Hi
13	34	79	1	3	2	4	2	02	20	Hi	Hi	Hi
03	57	79	1	2	4	5	2	01	20	Lo	Hi	Lo
11	49	70	4	4	2	4	3	01	19	Lo	Lo	Hi
13	41	62	1	2	4	3	2	02	20	Hi	Hi	Hi
23	62	68	4	2	5	3	1	01	19	Hi	Hi	Lo
12	42	73	1	2	1	5	1	00	18	Hi	Hi	Hi
11	41	82	2	3	2	4	3	01	19	Hi	Lo	Lo
08	47	71	1	3	3	5	2	01	18	Hi	Hi	Hi
15	50	68	2	4	1	4	2	04	18	Hi	Hi	Hi
16	33	78	1	3	1	5	3	06	18	Hi	Lo	Lo
10	35	77	1	5	3	5	2	03	19	Hi	Hi	Hi
04	37	88	2	3	3	3	2	03	18	Hi	Hi	Hi
11	54	75	2	4	3	5	2	01	18	Hi	Hi	Hi
12	45	83	1	4	1	5	2	08	19	Lo	Lo	Lo
11	43	60	1	3	2	5	2	02	19	Lo	Hi	Lo
19	42	65	3	5	2	3	2	01	19	Hi	Hi	Hi
12	41	74	2	2	4	4	2	01	18	Lo	Lo	Lo
16	41	68	1	3	3	5	2	01	19	Lo	Hi	Hi
15	31	61	3	3	3	3	1	01	17	Hi	Hi	Hi
05	50	82	1	5	2	4	2	05	20	Hi	Hi	Lo
06	43	57	1	4	2	5	2	06	18	Hi	Hi	Hi
12	41	58	2	4	1	4	2	07	19	Lo	Lo	Hi
10	35	70	1	4	2	3	2	01	18	Hi	Hi	Hi
10	42	65	2	2	3	4	2	03	18	Lo	Lo	Hi
15	42	73	1	4	3	4	2	01	19	Hi	Lo	Lo
15	26	83	3	1	4	4	3	03	18	Lo	Lo	Lo
10	39	69	2	4	3	3	2	01	18	Lo	Lo	Lo
14	73	76	1	2	4	5	2	05	18	Hi	Hi	Lo
14	33	70	2	3	4	3	2	02	19	Hi	Hi	Hi
16	28	76	2	5	2	1	3	03	20	Lo	Lo	Lo
12	58	71	2	2	2	1	2	02	20	Lo	Lo	Lo
10	31	73	3	4	3	2	2	01	19	Lo	Hi	Hi
10	28	78	5	1	5	4	2	01	18	Lo	Lo	Lo
06	24	81	2	2	2	4	2	01	19	Lo	Lo	Lo
18	26	74	3	3	3	3	2	02	18	Lo	Lo	Lo
17	28	65	5	1	1	1	1	04	18	Lo	Lo	Lo
08	28	60	2	4	3	5	2	02	19	Lo	Lo	Hi
13	34	66	4	4	4	1	2	01	22	Hi	Hi	Hi
13	26	68	2	3	3	4	2	01	19	Lo	Hi	Lo
11	30	77	2	1	5	3	1	01	22	Lo	Hi	Lo
13	27	69	1	5	3	5	3	07	18	Lo	Lo	Lo
11	46	74	1	3	5	5	3	02	19	Hi	Hi	Lo
11	30	82	3	4	2	3	3	09	19	Hi	Hi	Hi
08	28	76	2	3	2	4	2	01	19	Lo	Hi	Hi
06	30	69	1	3	3	4	2	01	20	Lo	Lo	Lo
11	30	65	5	3	3	3	2	01	19	Lo	Lo	Lo
12	28	63	2	2	2	5	1	01	18	Lo	Lo	Hi
11	31	59	4	3	2	2	2	01	19	Lo	Lo	Lo
11	34	67	2	1	3	2	3	04	18	Lo	Lo	Hi
16	35	64	1	2	2	5	1	00	18	Hi	Hi	Hi
06	23	80	2	3	2	4	2	03	19	Hi	Hi	Hi
12	30	72	4	2	2	4	2	04	19	Lo	Lo	Lo
15	30	62	2	1	2	4	3	07	19	Lo	Lo	Lo
13	29	45	2	1	3	3	3	01	18	Lo	Lo	Lo
12	31	60	2	2	3	4	3	01	18	Lo	Lo	Lo
09	21	77	4	2	3	2	2	01	19	Lo	Lo	Lo
09	29	73	2	5	4	3	2	01	20	Lo	Lo	Lo
12	28	87	2	1	3	4	3	07	20	Lo	Lo	Lo
15	40	71	2	3	3	4	2	01	21	Hi	Hi	Hi
13	32	78	2	1	3	3	2	01	19	Hi	Hi	Lo

REFERENCES

REFERENCES

- Barratt, E. S. Anxiety and impulsiveness related to psychomotor efficiency. Perceptual and Motor Skills, 1959, 9, 191-198.
- Birney, R. C., Burdick, H., & Teevan, R. C. Fear of failure. New York: Von Nostrand, 1969.
- Chapeau, Peggie L. Test anxiety and feedback in programmed instruction. Journal of Educational Psychology, 1968, 59, 159-163.
- Denny, J. P. Effects of anxiety and intelligence on concept formation. Journal of Experimental Psychology, 1966, 72, 596-602.
- Fishman, Elizabeth J., Keller, L. and Atkinson, R. C. Massed versus distributed practice in computerized spelling drills. Journal of Educational Psychology, 1968, 59, 290-296.
- Hodges, W. F. The effects of success, threat of shock, and failure on anxiety. Unpublished doctoral dissertation; Vanderbilt University, 1967.
- Hodges, W. F. Effects of ego threat and threat of pain on state anxiety. Journal of Personality and Social Psychology, 1968, 8, 364-372.
- Hodges, W. F., & Spielberger, C. D. The effects of threat of shock on heart rate for subjects who differ in manifest anxiety and fear of shock. Psychophysiology, 1966, 2, 287-294.
- Hughes, J. B., II, Sprague, J. L., & Bendig, A. W. Anxiety level, response alteration, and performance in serial learning. Journal of Psychology, 1954, 38, 421-426.
- Hull, C. L. Principles of behavior. New York: Appleton, 1943.
- International Business Machines Corporation. IBM 1401, 1440, or 1460 Operating System. Computer Assisted Instruction. New York, IBM, 1965.
- International Business Machines Corporation. IBM 1500 Coursewriter II Author's Guide. Part I: Course Planning. New York, IBM, 1967.
- Kamin, L. J., & Fedorchack, Olga. The Taylor scale, hunger, and verbal learning. Canadian Journal of Psychology, 1957, 11, 212-218.

- Katahn, M., & Branham, L. Effects of manifest anxiety on the acquisition and generalization of concepts from Hullian Theory. The American Journal of Psychology, 1968, 81, 575-580.
- Katahn, M., & Dean, S. Anxiety and stress in paired-associate learning with manipulated initial response strength. Psychological Reports, 1964, 14, 959-965.
- Katahn, M., & Lyda, L. L. Anxiety and the learning of response varying in initial rank in the response hierarchy. Journal of Personality, 1966, 34, 287-299.
- Katkin, E. S. Relationship between manifest anxiety and two indices of autonomic response to stress. Journal of Personality and Social Psychology, 1965, 2, 324-333.
- Kight, H. R., & Sarrenrath, J. M. Relationship of achievement motivation and test anxiety to performance in programmed instruction. Journal of Educational Psychology, 1966, 14, 185-191.
- Lucas, J. D. The interactive effects of anxiety, failure, and intra-serial duplication. American Journal of Psychology, 1952, 65, 59-66.
- Mandler, G., & Sarason, S. B. A study of anxiety and learning. Journal of Abnormal and Social Psychology, 1952, 47, 166-173.
- Montague, E. K. The role of anxiety in serial rote learning. Journal of Experimental Psychology, 1953, 45, 91-96.
- O'Neil, H. F., Hansen, D. N., & Spielberger, C. D. Errors and latency of response as a function of anxiety and task difficulty. Paper presented at the American Education Research Association, Los Angeles, 1969.
- O'Neil, H. F., Spielberger, C. D., & Hansen, D. N. The effects of state-anxiety and task difficulty on computer-assisted learning. In press: Journal of Educational Psychology, 1969.
- O'Reilly, R. P., & Ripple, R. E. The contribution of anxiety, creativity and intelligence to achievement with programmed instruction. Paper presented at the American Education Research Association, New York, 1967.
- Raymond, C. K. Anxiety and task as determiners of verbal performance. Journal of Experimental Psychology, 1953, 46, 120-124.

- Sarason, I. G. The effects of anxiety and two kinds of failure on serial learning. Journal of Personality, 1957, 25, 383-392.
- Sarason, I. G. Intellectual and personality correlates of test anxiety. Journal of Abnormal and Social Psychology, 1959, 59, 272-275.
- Sarason, I. G. Empirical findings and theoretical problems in the use of anxiety scales. Psychological Bulletin, 1960, 57, 403-415.
- Sarason, I. G. Test anxiety and the intellectual performance of college students. Journal of Educational Psychology, 1961, 52, .
- Sarason, I. G. Test anxiety and intellectual performance. Journal of Abnormal and Social Psychology, 1963, 66, 73-75.
- Sarason, S. B., Davidson, K. S., Lighthall, F. F., Walte, R. R., & Ruebush, B. K. Anxiety in elementary school children. New York: Wiley, 1960.
- Spence, Janet T., & Spence, K. W. The motivational components of manifest anxiety: Drive & drive stimuli. In C. D. Spielberger (Ed.), Anxiety and behavior. New York: Academic Press, 1966, Pp. 291-326.
- Spence, K. W. A theory of emotionally based drive (D) and its relationship to performance in simple learning situations. American Psychologist, 1958, 13, 131-141.
- Spence, K. W. Anxiety (drive) level and performance in eyelid conditioning. Psychological Bulletin, 1964, 61, 129-139.
- Spence, K. W., & Spence, Janet T. Sex and anxiety differences in eyelid conditioning. Psychological Bulletin, 1964, 65, 135-142.
- Spielberger, C. D. On the relationship between manifest anxiety and intelligence. Journal of Consulting Psychology, 1958, 22, 220-224.
- Spielberger, C. D. Theory and research on anxiety. In C. D. Spielberger (Ed.), Anxiety and behavior. New York: Academic Press, 1966, Pp. 3-20.
- Spielberger, D. C., Gorsuch, R. L., & Lushene, R. E. Manual for the State-Trait Anxiety Inventory. Palo Alto, California: Consulting Psychologist Press, 1969.
- Spielberger, C. D., Lushene, R. E., & McAdoo, W. G. Theory and measurement of anxiety states. In R. B. Cattell (Ed.), Handbook of modern personality theory. Chicago: Aldine, 1969.

- Spielberger, C. D., & Smith, L. H. Anxiety (drive), stress, and serial position effects in serial verbal learning. Journal of Experimental Psychology, 1966, 72, 589-595.
- Taylor, Janet A. A personality scale of manifest anxiety. Journal of Abnormal and Social Psychology, 1953, 48, 285-290.
- Taylor, Janet A. Drive theory and manifest anxiety. Psychological Bulletin, 1956, 53, 303-320.
- Taylor, Janet A., & Chapman, Jean P. Anxiety and the learning of paired-associates. American Journal of Psychology, 1955, 68, 671.
- Tobias, S., & Williamson, J. Anxiety and response to programmed instruction. Paper presented at the American Education Research Association, Chicago, 1968.
- Tyler, Leona E. The psychology of human differences. New York: Appleton, 1965.
- Watson, G., & Glasser, E. M. Watson-Glaser Critical Thinking Appraisal Form Am. Chicago, Illinois, World Book Company, 1951-2.
- Zuckerman, M. The development of an affect adjective check list for the measurement of anxiety. Journal of Consulting Psychology, 1960, 24, 457-462.

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Education

- 1960-1962 Classics, Cardinal O'Connell Seminary,
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- 1962-1965 A.B., cum laude, (1965), Psychology, Boston College,
Chestnut Hill, Massachusetts
- 1965-1966 M.S., (1968), Experimental Psychology, Hollins College,
Hollins College, Virginia
Thesis: Aggression Anxiety as a Function of Birth
Order and Social Class.
- 1966-1969 Ph.D., (1969), Experimental Psychology, Florida State
University, Tallahassee, Florida; (Minor: Educational
Research)
Dissertation: Effects of Stress on State Anxiety
and Performance in Computer-Assisted Learning

Positions Held

6/69 - Florida State University, Instructor in Psychology and
present Research Associate in the Division of Instructional Research
and Service.

Post doctoral appointment: major responsibility in
directing research in two areas: (1) personality and
computer-assisted learning, and (2) computer assessment
of both intelligence and personality. Assisted in teaching
of graduate seminars.

Positions Held (Continued)

7/67 - 5/69 Florida State University, U. S. Office of Education Fellow in Computer-Assisted Instruction; Research Assistant.

Surveyed existing electronic equipment IBM 1440, IBM 1500, CDC 6400 systems and computer languages that operate the CAI system. Utilization of the CAI system. This included an operational understanding of the hardware system, how to program it, and how to obtain sophisticated data analysis. Authored a course and evaluated its efficiency on the IBM 1500 and 1440 systems. Served as a consultant to other trainees in statistics and experimental design. Ran six experimental studies. Read two papers at AERA national conventions.

9/66 - 6/67 Florida State University, NIMH Fellow-Trainee in School Psychology

Attended regional conference on school psychology (SEPA). Three days of conferences, etc. Ran thesis, "Aggression Anxiety as a Function of Birth Order and Social Class." Completed vicious-circle study with rats as Ss.

6/66 - 8/66 Department of Education, City of Roanoke, Virginia, Psychometrist.

Participated in intensive training program on administration of individual intelligence tests. Made complete review of the reliability and validity studies on such instruments and on projective tests such as the Bender-Gestalt. Held conferences with parents, teachers concerning the interpretation and use of the test results for individual children.

9/65 - 6/66 Department of Psychology, Hollins College, Virginia, Research Assistant.

Selected and modified research designs in general area of ~~infant language development~~. Interviewed parents concerning past history of children. Quantified data by means of a sound spectrograph. Read paper at regional convention.

8/62 - 7/65 Metropolitan State Hospital, Waltham, Massachusetts, Psychiatric Aide

Had complete charge of administration and supervision of six-month drug project during 40 hour work week. Collected data (ratings, behavioral observation, and physiological measures) pre and post-drug administration. Suggested use of double blind study, which was adopted. Extensive experience on all wards of the hospital: disturbed, geriatric, alcoholic, and acute. Assisted in the supervision and management of occupational therapy for patients.

Professional Affiliations

American Association of University Professors
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Present Research Interests

Effects of Anxiety and Other Personality Factors in Computer-Assisted Learning; Computer Assessment of Intelligence and Personality

Publications

- O'Neil, Jr., H. F., Spielberger, C. D., & Hansen, D. N. Effects of state anxiety and task difficulty on computer-assisted learning. Journal of Educational Psychology, 1969, 60(5), 343-350. Paper read at the American Educational Research Association Convention, Chicago, 1968.
- O'Neil, Jr., H. F., Skeen, K. C., & Ryan, F. J. Prevention of vicious-circle behavior. In Press, Journal of Comparative & Physiological Psychology.
- Hansen, D. N., Dick, W., Lippert, H. T., Harvey, W., Majer, K., O'Neil, H., & Rivers, L. Research and implementation of collegiate instruction of Physics via computer-assisted instruction. Technical report No. 3, Computer-Assisted Instruction Center, Florida State University, 1968.
- Hansen, D. N., & O'Neil, Jr., H. F. Empirical investigations versus anecdotal observations concerning anxiety in computer-assisted instruction. Annual Progress Report, Computer-Assisted Instruction Center, Florida State University, 1968.
- Spielberger, C. D., Hansen, D. N., & O'Neil, Jr., H. F. Trait and state anxiety and computer-assisted learning. In B.A. Mahr (Ed.) Progress in Experimental Personality Research, Vol. 6, 1970.
- O'Neil, Jr., H. F. Effects of state anxiety and programming variables on performance in computer-assisted learning. A proposal submitted to the United States Office of Education, 1969.
- O'Neil, Jr., H. F. Effects of stress on state anxiety and performance in computer-assisted learning. Technical report No. 6, Computer-Assisted Instruction Center, Florida State University, 1969. (Accepted for American Educational Association Convention, Minneapolis, 1970.)

Papers Presented at Professional Meetings

- O'Neil, Jr., H. F., Hansen, D. N., & Spielberger, C. D. Errors and latency of response in computer-assisted learning as a function of anxiety and task difficulty. Paper read at the American Educational Research Association Convention, Los Angeles, 1969.
- Webster, R. L., O'Neil, Jr., H. F., & Jacobowitz, D. W. Infants' vocal response changes as a function of self-produced auditory stimulation. Paper read at the Southeastern Psychological Association Convention, 1966.
- Leherissey, Barbara, Hansen, D. N., & O'Neil, Jr., H. F. Effects of memory support upon anxiety and performance in computer-assisted learning. (Accepted for American Educational Association Convention, Minneapolis, 1970.)
- Lawler, R. M., O'Neil, Jr., H. F., & Hansen, D. N. Anxiety and confidence in computer-assisted Learning. (Accepted for American Educational Research Association Convention, Minneapolis, 1970.)

Papers in Preparation

- O'Neil, Jr., H. F. Aggression anxiety as a function of birth order and social class.
- O'Neil, Jr., H. F., Hansen, D. N., & Spielberger, C. D. Effects of anxiety in a computer-based physics course.
- O'Neil, Jr., H. F., Spielberger, C. D., & Hansen, D. N. Effect of anxiety and task difficulty on latency of response in computer-assisted learning.
- O'Neil, Jr., H. F., Freed, B., Wester, W., Hogshead, G., & Robinson, W. Documentation of edit and data preparation programs. To be issued as a Computer-Assisted Instruction Center Tech Report, Florida State University.
- O'Neil, Jr., J. F., & Papay, Sharon, & Hansen, D. N. Additional documentation on the IBM 1500 CAI system functions. To be issued as a Computer-Assisted Instruction Center Tech Memo, Florida State University.
- O'Neil, Jr., H. F., Spielberger, C. D., & Hansen, D. N. Studies of anxiety and computer-assisted learning, book in progress.

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DOCUMENT CONTROL DATA - R & D		
(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)		
1. ORIGINATING ACTIVITY (Corporate author) Florida State University Computer-Assisted Instruction Center Tallahassee, Florida 32306	2a. REPORT SECURITY CLASSIFICATION Unclassified	2b. GROUP
3. REPORT TITLE Effects of Stress on State Anxiety and Performance in Computer-Assisted Learning		
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Tech Report No. VI, January 1, 1970		
5. AUTHOR(S) (First name, middle initial, last name) Harold F. O'Neil, Jr.		
6. REPORT DATE January 1, 1970	7a. TOTAL NO. OF PAGES 117	7b. NO. OF REFS 47
8a. CONTRACT OR GRANT NO. N00014-68-A-0494	9a. ORIGINATOR'S REPORT NUMBER(S)	
b. PROJECT NO. NR 154-280	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
c.		
d.		
10. DISTRIBUTION STATEMENT This document has been approved for public release and sale; its distribution is unlimited.		
11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY Personnel & Training Research & Program Office of Naval Research Washington, D. C.	
13. ABSTRACT This study tested hypotheses about the effects of anxiety on learning derived from Spence-Taylor Drive Theory and Spielberger's Trait-State Anxiety Theory. The effects of stress on state anxiety (A-State) and on performance in a computer-assisted learning task were investigated for female introductory college students who differed in anxiety proneness (A-Trait). The Ss were selected on the basis of extreme scores on the A-Trait scale of the State-Trait Anxiety Inventory (Spielberger, et al., 1969). Stress was induced by feedback concerning performance on a mathematical learning task which was presented by an IBM 1500 CAI system. In the stress condition, Ss received negative feedback about performance. The Ss in the nonstress condition were given a brief rest period in place of the negative feedback.		

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13. ABSTRACT - continued

High A-Trait (HA) Ss in the stress condition showed a significantly greater initial increase in A-State from pretask levels than did the low A-Trait (LA) Ss. During the learning task, HA Ss in the stress condition showed a marked decline in A-State whereas level of A-State remained relatively constant for LA Ss. In the nonstress condition, the changes in A-State for HA and LA Ss were quite similar. Both groups showed almost the same increase in A-State from pretask levels and approximately parallel changes in the level of A-State during the learning task.

There was no relationship between A-Trait and errors on the CAI learning task. In contrast, Ss with high levels of A-State made more errors than low A-State Ss throughout the learning task. The differences in the performance of high A-State and low A-State Ss were significant on the easier sections of the CAI task, but not for the most difficult part of the task. These relationships between A-State and errors differed from previous research (O'Neil, Hansen, & Spielberger, 1969).

The findings were consistent with predictions derived from Trait-State Anxiety Theory, but not with derivations from Drive Theory. The failure to find empirical support for Drive Theory was attributed to differences in the motivational structures of men and women that affect the relationship of Drive (A-State) and performance.